DOCUMENT RESUME

ED 053 821 24 PS 005 068

AUTHOR	Kelly, Inga K.
TITLE	The Effects of Differentiated Instruction in Visuo-Motor Skills on Developmental Growth and Reading Readiness at Kindergarten Level. Final Report.
INSTITUTION	Washington State Univ., Pullman.
SPONS AGENCY	National Center for Educational Research and Development (DHEW/CE), Washington, D.C.
BUREAU NO	BR-0-I-097(X)
PUB DATE	Aug 71
GRANT	OEG-X-71-0011(057)
NOTE	133p.
EDRS PRICE	EDRS Price MF-$0.65 HC-$6.58
DESCRIPTORS	Caucasians, *Classroom Communication, *Form Classes (Languages), *Kindergarten Children, Language Development, Negro Students, Negro Teachers, *Vocabulary Development

ABSTRACT

The focus of this study was to analyze the classroom language of kindergarten teachers and to relate this information to various normative estimates of the language repertoire of young children. A total of 104 5-minute samples were tape recorded for 15 kindergarten teachers. Transcripts were later checked by an independent listner. These scrits formed the data base for all teacher language analyses. In he first analysis, the words were listed according to parts of speech, and correlations between this language corpus and 2 major listings of children's vocabulary (Thorndike-Lorge and Rinsland) were found to be significant. Over 60 percent of the language used by teachers is within the expected level of familiarity. The 40 percent balance of unfamiliar words may be considered the word load to which these children were exposed in the process of vocabulary acquisition. A Flanders-type analysis of the nature of the communications conveyed by the teachers' language with reference to teacher style across ethnic and socioeconomic (SES) groups revealed that Caucasian teachers of both high SES black children and low SES white children use more verbal reinforcement than was noted with Caucasian teachers with high SES white children or black teachers with low SES black children. In general, Caucasian teachers of high SES Caucasian children give fewer verbal supports, whereas black teachers of low SES black children are the warmest and most supportive. (Author/AJ)

ED053821

0-I-097
PA-24
OE-NCERD
PS

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Final Report

Project No. 0-I-097(X)
Grant No. OEG-X-71-0011(057)

THE EFFECTS OF DIFFERENTIATED INSTRUCTION IN VISUO-MOTOR SKILLS ON DEVELOPMENTAL GROWTH AND READING READINESS AT KINDERGARTEN LEVEL

Inga K. Kelly

Washington State University

Pullman, Washington 99163

August 1971

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

PS005068

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
National Center for Educational Research and Development

TABLE OF CONTENTS

Page

LIST OF TABLES iii

Chapter

I. INTRODUCTION 1

Statement of the Problem 1
Significance of the Problem 1
Related Research 4

II. RESEARCH DESIGN AND PROCEDURES 11

Population 11
Selection of the Sample 11
Visual-Motor Programs and Procedures 14
Null Hypotheses 18

III. ANALYSIS OF THE DATA 21

Introduction 21
Testing for Equivalency of Experimental and Control Groups by Level 21
Testing the Null Hypotheses 23
Analysis of Performance of Visual-Motor Subtests 31

IV. SUMMARY AND CONCLUSIONS 35

Purpose of the Study 35
Summary of Analysis of the Findings 35
Limitations of the Study 37
Discussion of Findings Related to Developmental Growth 38
Discussion of Findings Related to Reading Readiness . . . 39
Discussion of Performance of Specific Visual-Motor Measures 40
Discussion of Findings Related to Organizational Patterns 41
Other Reactions and Observations 42
Conclusions and Recommendations 44

V. BIBLIOGRAPHY 46

Appendix

A. LOCALLY PRODUCED PROGRAMS 50

Development of Dominant Handedness. 51
Drawing and Writing 53
Geometric Inserts 67
Stacking and Aligning Blocks. 71

B. DEVELOPMENTAL LEARNING MATERIALS AND PROGRAMS 79

Clear Stencils. 80
Inch Cube Designs 81
Large Parquetry Designs 83
Small Parquetry Designs I 85
Small Parquetry Designs II. 86
Small Parquetry Designs II, Class Record. 87
Small Parquetry Designs III 88
Designs in Perspective. 89

C. THE DUBNOFF SCHOOL PROGRAM, LEVEL 1 90

Section A - Straight Line Concept 91
Section B - Circles 94
Section C - Diagonal Line Concept 96
Section D - Intersecting Line Concept 100
Dubnoff Program, Level 1, Summary Sheet 101
Horizontal Line Exercise. 103
Section A - Straight Line Concept, Class Record 105
Section B - Circular Concept, Class Record. 106
Section C - Diagonal Line Concept, Class Record 107
Section D - Intersecting Lines Concept, Class Record. . . . 108

D. MISCELLANEOUS 109

Minicourse Schedule 110
Questionnaire 112
Tape Scripts. 113
Summary of Components of Kindergarten Visual-Motor Program. 116

E. TEST DATA 118

Table 1: Test Data 119
Table 2: GDPE Age Equivalents and Converted Scores 128

LIST OF TABLES

Table | Page
1. Number of Children in Each Developmental Level Age Category 13
2. Experimental and Control Groups by Classroom 14
3. Number of Subjects in Each Comparison Group. 21
4. GDPE Pretest Means and Standard Deviations for Experimental and Control Groups 22
5. Summary of Analysis of Variance: GDPE Pretest 22
6. Summary of Analysis of Variance: GDPE Posttest Experimental and Control High Development Groups. . . 23
7. Summary of Analysis of Variance: GDPE Posttest Experimental and Control Low Development Groups . . . 23
8. Summary of Analysis of Variance: GDPE Posttest Experimental and Control Heterogeneous Development Groups. 23
9. Summary of Analysis of Covariance: GDPE Posttest Minus Pretest, Experimental High, Heterogeneous, Low Development Groups. 24
10. Summary of Analysis of Covariance: GDPE Posttest Minus Pretest, Control High, Heterogeneous, Low Development Groups. 24
11. Summary of Analysis of Covariance: GDPE Posttest Minus Pretest for Six Comparison Groups 25
12. Gates-MacGinitie Readiness Skills Test Means and Standard Deviations 26
13. Summary of Analysis of Variance: Gates-MacGinitie Readiness Skills Test, Experimental and Control High Development Groups 26
14. Summary of Analysis of Variance: Gates-MacGinitie Readiness Skills Test, Experimental and Control, Low Development Groups. 27

Table Page

15. Summary of Analysis of Variance: Gates MacGinitie Readiness Skills Test, Experimental and Control, Heterogeneous Development Groups. 27

16. Summary of Analysis of Covariance: GDPE Pretest and GMRST for Experimental and Control, High Development Groups. 27

17. Summary of Analysis of Covariance: GDPE Pretest and GMRST for Experimental and Control, Low Development Groups. 28

18. Summary of Analysis of Covariance: GDPE Pretest and GMRST for Experimental and Control, Heterogeneous Development Groups. 28

19. Summary of Analysis of Covariance: GMRST Experimental High, Heterogeneous, and Low Development Groups . . . 29

20. Summary of Analysis of Covariance: GMRST Control High, Heterogeneous, Low Development Groups 29

21. Summary of Analysis of Covariance: GDPE Pretest and GMRST for Six Comparison Groups 30

22. Summary of Scheffé Test for Mean Differences on GMRST. . 31

23. Chi Square Table: GDPE Copy Forms 32

24. GMRST Subtest VI, Visual-Motor Coordination, Means and Standard Deviations 33

25. Summary of Analysis of Variance: GMRST Subtest VI for Six Comparison Groups 33

26. Summary of Analysis of Covariance: GDPE Pretest and GMRST Subtest VI for Six Comparison Groups. . . . 34

Chapter I

INTRODUCTION

Statement of the Problem

The purpose of the study was to determine whether (1) readiness for reading at the kindergarten level can be enhanced by differentiated instruction in visuo-motor skills, (2) the Gesell Developmental Placement Examination is an effective instrument for inter-class grouping for instruction, and (3) developmental growth, as measured by the Gesell Developmental Placement Examination, can be accelerated by means of a specially designed, differentiated program in visuo-motor skills. In addition, an expected outcome of the research was the identification of types of multi-media and programed materials which might be useful in differentiating instruction in the kindergarten classroom.

Significance of the Problem

Emphasis on early childhood education, including kindergarten, has emerged as a focus of interest and ocncern during the past decade. Projects such as the Baltimore Early Admissions Program (1962) funded by the Ford Foundation, followed by a multitude of federally financed Head Start programs, were evidence of early interest in educational programs for the 3 to 5-year-old. By the midsixties, the commitment was such that the Educational Policies Commission (1966) recommended that public support for education be extended downward to include the 4-year-old.

Although initially the thrust was directed at children in poverty, a broader base for the early childhood priority was underscored in February 1969, when President Richard M. Nixon stated:

> So crucial is the matter of early growth that we must make a national commitment to providing all American children an opportunity for a beautiful and stimulating development during the first five years of life. (Voice for Children, 1970, p. 1)

The White House Conference on Children, held in December 1970, gave a large proportion of its attention to the education of young children. Included on the program were reports on a number of model early childhood programs financed by the U.S. Office of Education. Further demonstration of the national commitment to early childhood concerns came with the creation of an Office of Child Development in the Department of Health, Education, and Welfare in July 1969. The 1970 operating budget for the new office was $1.5 million, exclusive of Head Start.

Developments such as those described above resulted in an increasing number of states and local districts supporting kindergartens. A survey of 705 Northeastern school systems (Austin and Morrison, 1963) showed that 73.2 percent of the systems questioned maintained kindergartens. The 1969 NEA Research Report (NEA, 1969) indicated that 46 percent of the nation's public school systems operated kindergartens. So strong was the sentiment for providing quality education at the lowest level of public education that the 1971 State of Oregon legislature considered the withdrawal of support from grade twelve in order to support kindergarten education.

Current developments in early childhood education have been strongly influenced by the research and writings of educators and psychologists. In 1962, J. McVicker Hunt (Goldberg and Hottenlocker, 1966, p. HVN-33C) summarized research showing that educational intervention prior to age six could produce highly positive results. In a summary of longitudinal studies of intelligence, Benjamin S. Bloom (1964, p. 68) stated, " . . . in terms of intelligence measured at age 17, at least 20% is developed by age 1, 50% by age 4, 80% by about age 8 . . . . "

Evidence of the positive impact of educational programs was presented in a review of research by Mindees and Keliher (1967). Findings indicated that formal educational activities at age five increased IQ scores, raised reading and arithmetic achievement, and enhanced, in a measureable fashion, social and personal development. A study by Henderson and Long, reported by Sheldon (1969) showed pre-school education to be the best predictor of reading readiness. Hillerich's (1965) longitudinal study of children who learned to read in kindergarten indicated that early readers retained their advantage through primary and intermediate grades.

It must be noted, however, that the research on effects of kindergarten education has not all been favorable. Lavatelli (1968), in a review of the research comparing academic achievement of kindergarten and non-kindergarten children, reported the differences to be slight. Olson (1962) found no significant differences on two readiness measures between kindergarten and non-kindergarten first grade children. Conflicting data on the effectiveness of kindergarten programs are not surprising in view of the varying goals, curricula, organizational patterns, and approaches to individualization. The present study was designed to investigate the effectiveness of one aspect of curriculum content, that of visuo-motor skills, as well as programs for differentiating instruction in such skills, and bases for classroom organization.

Regardless of other curriculum considerations, there has always been the expectation that kindergarten will provide the developmental and academic prerequisites to reading instruction. Reading experts generally agree that visuo-motor and perceptual skills are basic to success in beginning reading (Monroe, 1969), (Smith and Dechant, 1964). It is also generally agreed that the period of maximum visual-perceptual development normally occurs between the ages of 3½ and 7½ (Frostig, 1964); that is, when the child is in kindergarten and the lower primary grades. Therefore, the focus of the present investigation was on the teaching of pre-reading skills--specifically visuo-motor and perceptual skills--in the kindergarten.

A differentiated program of instruction as viewed in this research contains two dimensions: (1) the organizational unit--that is, the way in which children are assigned to classrooms for the instructional program, and (2) the individual as a learner--that is, the selection and use of materials by an individual student. With regard to the organizational unit, the limitations of organizing a classroom on the basis of one variable, such as chronological age, IQ, or reading level are well-known, although plans such as non-grading (Goodlad, 1963) attempt to provide for differentiation by enabling students to move from one achievement level to another. The concept of behavioral level as a means for assigning children to classrooms has only recently come to the attention of educators, largely as a result of the book School Readiness (Ilg and Ames, 1965). Ilg and Ames propose that every child be given an individual behavior examination to determine the level of performance at the time he is being considered for school entrance. Included in the behavioral age data are assessments of the child's social awareness, such as knowledge of birthday, age, and father's occupation; cognitive development as measured by items adapted from IQ and reading readiness tests; observation of posture and tooth eruption; and interests, as measured by observation and open-ended questions. Ilg and Ames maintain that a measure of the behavior of the child as a total organism is more useful for educational placement than any one factor. Another purpose of this investigation, therefore, was to determine whether the Gesell Developmental Placement Examination is, in fact, a useful instrument for organizing for instruction at the kindergarten level.

Although the word "individualization" seems to have many meanings (Oettinger and Marks, 1968), for purposes of this study, the emphasis was on differentiation in rate of learning. In this sense, the model was similar to the prototype of programs such as IPI (Individually Prescribed Instruction) as described in Individually Prescribed Instruction (Research for Better Schools, no date). That is, the intent was to instruct students in visuo-motor skills in such a manner that they would achieve a level of competency which met a set of minimally acceptable performance criteria, but with variations in speed, level of achievement, and, to a certain extent, style of learning. While elaborate, technology-based programs have potential for use in kindergarten, not only are such programs limited in their applicability to the kindergarten level at this time, but they are costly as well. There is lacking in the research literature reports of attempts to individualize, differentiate, or personalize kindergarten programs in such a manner that a teacher in a typical classroom of 25 or more kindergarteners can administer the program without the presence of aides or exhorbitantly expensive materials, neither of which are available to most kindergartens. The research herein reported should make a contribution to this need.

Related Research

Visual-Motor Skills and Achievement

Visual-motor skills are those which permit the integration of visual perception and motor behavior. The terms perceptual-motor, perceptual, and visual perception as used in this review all relate to visual-motor functions. The relationship of these functions to reading and other educational problems has been the subject of a number of investigations. According to Frostig (1963), there is a clear connection between disabilities in visual perception and poor classroom adjustment at the lower age levels. She reports that for a sample of 110 kindergarten children, five that were designated as "very low" in adjustment scored in the lowest quartile on the perceptual test. No child rated "very high" in adjustment scored in the lowest quartile. Classroom adjustment was operationally defined as including not only academic achievement, but all behavior essential to the smooth functioning of the group.

Fabian (1945) studied the relationship between vertical rotation of the horizontal figures on the Bender Visual-Motor Gestalt Test and reading disability. All children included in the study had an IQ above 80 and were physically normal. All were administered the Bender Visual-Motor Gestalt Test. One group consisted of boys in the Children's Observation Ward at Bellevue Psychiatric Hospital in New York City. Twenty-one of the boys were non-readers and 25 were retarded readers. Results of the Bender showed that of the non-readers, 75 percent rotated one or more of the horizontal figures to the vertical position, while 50 percent of the retarded readers showed the same tendency. A second group consisted of 19 severely retarded readers in the third grade in New York City. Fifty-three percent of these subjects showed vertical rotation. However, of 98 third graders who were not retarded in reading, only 6 percent showed rotations.

While some researchers have studied the effects of visual-motor developmental lag, others have investigated the relationship between measures of visual-motor development and reading and language achievement. An assumption underlying DeHirsch's (1966, p. 13) research is that a child's perceptuomotor and language level at kindergarten age forecast his later performance on such highly integrated tasks as reading, writing, and spelling. Fifty-three children with a median age of 5 years, 10 months were administered a battery of kindergarten tests, including tests of motility, gross and fine motor, and visual perceptual patterning. At the end of grade two, the Gates Advanced Primary and the Gray Oral Reading Tests were administered. The spelling subtest of the Metropolitan Achievement Test, Primary II Battery and a four-sentence dictated writing test were also administered. The Bender Visual-Motor Gestalt Tests were significantly ($p < .01$) related to end of second grade overall reading performance, spelling, and writing. The pegboard speed test of the Fine Motor Patterning Battery correlated significantly ($p < .05$) with writing.

Goins (1958) investigated the relationship between tests of visual perception and reading achievement for 120 first grade pupils enrolled in the University of Chicago Laboratory School and in a Chicago public school. Measures used were the Chicago Reading Test and 14 tests adapted or modified from experimental visual perceptual tests devised by Thelma Thurstone. Tests were administered in December and in May. When correlated with the reading test, eight of the 14 visual perceptual tests showed statistically significant ($p < .05$) correlations in December. In May, 12 of the tests showed statistically significant ($p < .05$) correlations.

The relationship between perceptual ability and school achievement was studied by Lowder (1956). Every pupil ($N=1510$) in the first three grades of the Winter Haven, Florida public school system was given the task of copying seven geometric figures: circle, cross, square, triangle, divided rectangle, horizontal diamond, and vertical diamond. The adequacy of the copies was evaluated by expert judges. A correlation of .50 was found between copying performance and school achievement as measured by teachers' evaluations.

A number of current studies deal with the effects of perceptual-motor training on reading achievement at the kindergarten and early primary level. Stanchfield (1970) selected 17 schools in the Los Angeles Public School system from which to draw kindergarten classes to constitute an experimental group. The schools provided a cross section of socio-economic and ethnic categories. Each experimental school was matched with a control school of similar ethnic origins, academic achievement, and socioeconomic background. Teachers in experimental and control schools were randomly selected. There were 17 kindergarten classes in each group. A program of materials, lessons, and guides for sequential development of pre-reading skills in six major areas was developed for the experimental group. One area was that of motor-perceptual development. Exercises, games, and dances were used to develop gross motor control, while activities in construction, cutting, pasting, tracing, and coloring were provided for finer motor coordination. Later, paper and pencil exercises were used to further refine hand-eye coordination. At the end of the school year, the Murphy-Durrell Reading Readiness Analysis was administered to the experimental and control classes. Analysis of covariance for total scores on this measure showed significant differences ($p < .01$) in favor of the experimental group.

An investigation to evaluate the use of a sequence of learning activities for improving visual-motor skills of kindergarten subjects was conducted by Bosworth (1967). Subjects were randomly assigned to an experimental and control group pretested with the Visual Motor Tests and the Betts Word Form Test. During the experimental teaching period, the control group received the regular kindergarten program, and the experimental group received the regular program plus a program of differentiated teaching of visual-motor skills. Posttest data were obtained by readministration of the two tests. Results of analysis of covariance showed statistically significant differences ($p < .001$) in favor of the experimental group on both the measure of visual-motor achievement and the measure of reading readiness.

PS 005068

Falik (1969) administered the Anton Brenner Developmental Gestalt Test of School Readiness to approximately 90 entering kindergarten children in Dearborn, Michigan. Children ranking in the lower two-thirds on the measure were randomly divided into an experimental (N=20) and a control (N=22) group. A developmental program emphasizing gross motor development, eye-hand coordination, and visualization patterns was incorporated into the regular curriculum for the experimental group. At the end of the year, all subjects were retested with the Brenner Gestalt Test. The Metropolitan Readiness Test and a specially devised test of basic perceptual motor development were also administered. One and one-half years later, when the subjects were in the middle of the second grade, the reading section of the Metropolitan Achievement, Primary II battery was administered to experimental and control subjects. Results of statistical analysis showed no significant differences between the two groups on all test variables either at the end of kindergarten or at the middle of second grade. Falik concluded that provision for perceptual motor training in the curriculum for all children may not be warranted. He recommended further study with a clearer design and tighter control of variables.

Findings of an investigation by Keim (1970) tend to support Falik's position. Keim utilized the Winter Haven Program to study the effects of visual-motor training on an experimental class of 37 kindergarteners in Pennsylvania. The 74 children who demonstrated visual-motor deficiencies on the Bender Visual-Motor Gestalt Test were divided equally into an experimental and a control group. A second control group was selected randomly from among the children who evidenced no visual-motor defficulties. The three groups were equated on the basis of intelligence, as measured by the Peabody Picture Vocabulary Test and the Stanford-Binet, and on the basis of readiness for kindergarten, as measured by the Pre-Kindergarten Survey. All subjects were posttested at the end of the experimental teaching period with the Metropolitan Readiness Test, the Peabody Picture Vocabulary Test, the Stanford-Binet, and the Bender Visual-Motor Gestalt Test. Results of analysis of variance showed no significant differences among the three groups except for the Matching and Copying subtest raw scores of the Metropolitan Readiness Test. Forty percent of the experimental subjects and 57 percent of the control subjects with initial visual-motor difficulties continued to have poor visual-motor skill. However, teachers of the experimental group reported significant behavioral and many positive group responses to the program. Keim recommended that the study of applicability of visual-motor training be continued and urged that particular attention be given to materials and techniques.

While the relationship between visual-motor functions and reading success seems to be clearly established, the extent to which such functions can be developed by means of specific instruction is in question. The research of this investigator was designed to provide further knowledge about materials, techniques, and results of visual-motor programs for kindergarten children.

Developmental Level and Growth

The concept of developmental level, as used in the present study, covers a number of considerations identified in the subtests of the Gesell Developmental Placement Examination (Ilg and Ames, 1965). They include: oral questions concerning the child's immediate knowledge, experience, and powers of organization; ability to print name, address, date, numbers; copy forms; Incomplete Man; Right and Left Organization; Monroe Visual Tests; naming animals; home and school preferences. The test purports to yield a "developmental level" in the form of a behavior age which describes the child as a total organism. Ilg and Ames contend that entrance into school should be contingent upon reaching a 5-year-old developmental age for kindergarteners and a 6-year-old developmental age for first graders. A similar rationale was presented by Sapir and Wilson (1967) who developed an instrument to predict learning disabilities, The Sapir Developmental Scale. This scale, which measures perceptual-motor development, body schema awareness, and language development, was administered to 54 kindergarten children of high socioeconomic status. After one year, the New York State Readiness Test was given, and after 17 months, the Stanford Achievement Test, Primary I was administered. The Sapir Developmental Scale correlated with the New York Readiness Test at $r = .66$, $p = < .001$. The correlation with the Stanford Achievement Test was $r = .64$, $p = < .001$ for all subtests except vocabulary, where $p = < .05$. Sapir and Wilson suggest that children be given special instruction to remediate weaknesses detected by the Scale.

Child development specialists have also taken note of the importance to educators of developmental level. Using the term "maturation" rather than developmental level, Mussen, Conger, and Kagan (1969, p. 102) state, "Because maturation proceeds at such a rapid rate in children, it is important to take its possible effects into account in studies of children's learning." Baller and Charles (1968, p. 22) state,

> If teachers are sensitive not only to the delimiting function of a child's maturation but also, on the positive side, to the signs of readiness for this or that kind of response, they will increase their effectiveness in helping the child to grow and learn.

The work of Piaget has divided the child's life into a series of developmental stages. Phillips (1969) has made some concrete educational applications for school curriculum for each of these stages. For the child in the "Sensorimotor" stage, he suggests Kephart's perceptual development program. The child in the "Preoperational" stage should receive a suggested program which teaches the concept of conservation. For the child who is presently in the "Concrete Operations" stage, Phillips recommends Suchman's Inquiry Training Program. Each of the instructional programs suggested by Phillips is designed to prepare the child for and accelerate his entrance into the next stage.

Writers of kindergarten methods textbooks have also taken at least passing notice of varying developmental levels of 5-year-old children. Foster and Headley (1966, pp. 454-455) note, " . . . a certain number of somewhat immature children may be expected in any kindergarten group . . . the teacher's task is to adapt the program so that the immature child will have something he can do with satisfaction and without disturbing the rest of the group." Recognition of the necessity to gear kindergarten curriculum to developmental levels is given by Leeper, Dales, Skipper, and Witherspoon (1968, p. 126) who state, " . . . in planning good days, consideration is always given to the maturity of the child--be he two or twelve. The task is geared to his level of development." An exhortation to become aware of developmental differences is also given by Logan (1960, pp. 36-37) who warns that, "From infancy throughout childhood, the maturation rate affects significantly what children can do, how they react in particular situations, and how they feel about themselves and others."

The question of the possibilities of accelerating developmental growth is by no means resolved. Sigal (1964) delineated the two conflicting theories of child development. Gotstein and Scheerer, Tanner and Inhelder, and Piaget and Werner represent the stage-development theorists who hold that abilities develop in a sequential, invariant order which will not respond to educational intervention. Jensen (1969), in his socially controversial publication, questioned the possibility of accelerating the basic cognitive processes. Roche (1962, p. 233) stated, concerning children who are not ready for reading, "Their rate in moving ahead depends on their speed of maturation in mental, social, and emotional areas. This cannot be accelerated."

Conversely, Ausubel, Estes, Hunt, Sears, and Deutsch represent those who hold that the child is, to a large extent, the product of his environment and learning experiences. This theory has led to the intervention programs of Head Start and similar early childhood compensatory activities. Hendrickson and Muehl (1967) showed that with attention and motor-response training, children could learn to discriminate the 'd', 'b' inversion considerably earlier than normative data indicates. They warn that "experimental results suggest caution in the application of the concept of readiness when this concept is used to prescribe appropriate age levels at which children can optimally learn a particular task" (p. 122). Following an experiment with kindergarten children, Prichett and Ojemann (1965, p. 192) stated, "changing the environment can speed up Piaget's timetable." Tyler (1969) cited work done by Covington, Bereiter and Engleman, Dobbin, and Durkin as indicative of a present tendency to be less concerned about maturation and developmental levels and more concerned with materials and methods which accelerate pre-reading and pre-academic skills. A major purpose of this research was to determine whether developmental growth can be accelerated by means of a specially designed, differentiated program.

Effects of Differentiated Instruction

Experimental programs which have been successful in speeding up developmental functions have been characterized by intensive or massive instruction in a specific skill or function with children who are deficient in that skill. Ames (1969) identified second graders who were in the lowest third in performance on the Bender Gestalt Test in the

Cheshire, Connecticut public schools. Two classes of perceptually handicapped children constituted the experimental classes, while one was identified as a control class. The children were administered the Gesell Incomplete Man Test and the Lowenfeld Mosaic in the fall, before a training program was begun, and again six months later. The perceptually handicapped children lagged from 16.6 to 23.8 months behind the average expectation for second graders on the initial administration of these tests. The experimental classes were given half an hour a day of intensive exercises and activities aimed at improving coordination and orientation. At the end of 6 months, children in the experimental classes gained 8.7 months on the Gesell Incomplete Man Test, while the control class gained only 4.2 months. On the Mosaic Test, the experimental group gained an average of 9.5 months and the control group averaged only a 2.5 months gain. Thus, children who were given special training achieved beyond the expectation of a 6 month gain, while children similarly handicapped and without special training fell even farther behind their age expectation on the first test. Ames concluded that perceptual training can help a child who is lagging developmentally to perform at his or her highest potential developmental level. She questioned whether training actually speeds up development, although children who are functioning substantially below their expected age level tend to fall increasingly behind unless curative measures are provided.

Gray and Klaus (1965) reported on a 3 year program for culturally deprived pre-school children in the upper South. Two experimental groups and one control group were drawn from a pool of 60 children that met the criteria of cultural deprivation. A second control group consisted of 27 children from homes that met the same criteria but were located in a similar small city 60 miles distant. Treatment groups participated in a program designed to structure experimental differences in terms of three stimulus-potential and five reinforcement dimensions. The average ratio of adults to children was 1 to 5. Daily lesson plans were worked out so that experiences were devised in accordance with the current status of individual children. Tests of intelligence and language administered just prior to entrance to public schools showed significant gains ($p < .01$) for the experimental group, while the control groups showed losses.

Programs which are more general in nature, using a kit, laboratory, or training program to give the same treatment to all members of a class are less likely to produce significant, lasting, or transferable results than those designed to instruct in a specific function to a specific deficiency. Milligan (1966) investigated the effect of the Peabody Language Development Program upon the psycholinguistic abilities of normal kindergarten children. Ninety-seven kindergarten children drawn from the same population were randomly assigned to experimental and control groups. Experimental groups were taught daily lessons from the Peabody Language Development Kit while the control groups were taught a conventional language program. After 24 weeks, the Illinois test of Psycholinguistic Abilities and the Metropolitan Readiness Test was administered to all subjects. Experimental subjects scored a significantly greater mean ($p < .05$) on the Metropolitan Readiness

Test. Milligan concluded that further research was needed before a language program such as the Peabody Kit can be recommended for general use with normal kindergarteners.

The purpose of a study by Singer, Balow, and Dahms (1968) was to determine which, if any, of six teaching strategies would be most effective in developing reading readiness. The basic assumption underlying the research was that reading readiness is an achievement variable and hence susceptible to educational development. All kindergarten teachers volunteered participation in one of six programs which represented positions on a continuum. The strategies were identified as: (1) Adjustment, (2) Irrelevant Picture-type Reading Readiness, (3) Relevant Picture-type Reading Readiness, (4) Development of Conceptual Responses to Printed Words, (5) Language Arts Approach, and (6) Formal Reading Program. The Lee-Clark Reading Readiness Test was administered as a pretest on March 1 and as a posttest on June 1. Results of analysis of covariance showed no significant differences among the strategies. Examination of the readiness test data showed that many children were "ready" for reading instruction at the pretest time and others became "ready" before the posttest time. The researchers concluded that many children were being delayed in reading instruction and that provision should be made for individual differences by adopting the teaching strategy of a differentiated curriculum.

C. B. Lavatelli (1968, p. 12), who reviewed research in kindergarten education, concluded, "Average gains made in inventory-type programs (those teaching to test item weaknesses) have been slight because there has not been an adequate, specific-enough program to overcome the difficulty." James L. Hymes, Jr. (1970, p. 36) has stated, "We have programs for young children because fours and fives are fully ready to learn if we will but have the wisdom and sensitivity to adjust the ways of teaching to fit them." The research and the opinions of experts in the field point to the need for further research in differentiated instruction. For this reason, the investigation described in this report has, as an integral component, the differentiation of instruction in visual-motor skills.

Chapter II

RESEARCH DESIGN AND PROCEDURES

Population

The study was conducted in the public kindergarten of Pullman, Washington, a town with a population of 19,000 located in an agricultural area in southeastern Washington. The total district enrollment of 2880 included 253 kindergarten children. Due to crowded conditions, one school building in the district was used to house all of the kindergarten classes. Each pupil attended kindergarten for one-half day, forenoon or afternoon, five days per week, for approximately nine months. In almost every case, pupils were assigned to the morning or the afternoon kindergarten session according to residence; that is, according to the neighborhood elementary school which would be attended during elementary schooling. Pupils were from rural farm families, small business and civil servant families, and students and professional families associated with Washington State University.

Selection of the Sample

A condition for admission to kindergarten set by the administration of the Pullman Public School for fall, 1970, was that a child must have reached the age of five by September 1 and that he or she must have been tested by the Gesell Developmental Placement Examination (GDPE). The requirement of Developmental Placement testing was an outgrowth of several years of study by Pullman school personnel of ways to assess the status of young children so that programs appropriate to characteristics of individual students could be developed. The focus for 1970-71 was on classroom organization on the basis of developmental level for a limited number of classes and on the urilization of differentiated programs in visual-motor skills on an experimental basis in selected classes.

The Gesell Developmental Placement Examination is an extension of the Gesell Developmental Schedules. Carter V. Good (1949, p. 277), reviewing the Gesell Developmental Schedules for the Third Mental Measurement Yearbook (Buros, 1949) stated, "While . . . addressed primarily to the physician, it contains much of value to educational and psychological workers . . . . "

The Gesell Developmental Placement Examination is described in School Readiness (Ilg and Ames, 1965). The examination was developed at the Gesell Institute of Child Development for the purpose of providing explicit criteria for determining when the child should enter school.

The examination was standardized using a sample of 301 children from the public schools of North Haven, Connecticut. These children, ranging in ages from 4-11 to 10, were given a total of 700 examinations. Sixty-five boys and 65 girls were examined once a year for four years to provide measurement of longitudinal growth. Other subjects were added as needed to provide a sufficient number of examinations. Analysis of the population revealed that the subjects were above average in intelligence, with a mean IQ of 117.4, and all of upper or middle socioeconomic status. Ilg and Ames reported 83 percent agreement between results of the developmental examination and the teachers' estimates for kindergarten subjects.

Seven subtests are included in the Gesell Developmental Placement Examination. The first of these is the Initial Interview. Questions about age, birth date, social activities, siblings' names and ages, and familiarity with the father's occupation give information about the child's awareness and social maturity. The second subtest is a series of paper and pencil tasks which are common to standardized readiness tests and reveal the level of eye-hand coordination and visual perception. These tasks include writing name and address, numbers 1 to 20, copying six basic forms, and completing an Incomplete Man figure. The third subtest, termed Right and Left, includes naming parts and side of body, carrying out single and double commands, and responding verbally and by motor action to pictures. The Form Tests, the fourth subtest, utilizes the visual tests from the Monroe Reading Readiness Test. The Form Tests include matching forms, memory for designs, and projection into forms, all being related to visual perception and cognitive function. The final cognitive development measure used is the Naming of Animals for 60 seconds. This test, borrowed from the Stanford-Binet Intelligence Test, is designed to measure verbal fluency. The examination concludes with another interview in which the subject's activity preferences are determined, followed by an assessment of the stage of tooth eruption. The final interview and assessment of teeth are listed as tests six and seven.

The examination may be administered in either a 40 minute full battery or a 15 minute screen. Scores yielded are age equivalents, ranging from 4½ to 10.

The Gesell Developmental Placement Examination has been receiving increasing attention. In a review of the test and manual, Bragdon (1965, p. 472) stated, " . . . should be most useful to people who seek understanding of children, specifically, those who are involved in research projects dealing with young children." The usefulness of the GDPE in setting a school starting age was emphasized by Lindberg (1965, p. 31).

In the present study, subjects were individually administered the 15 minute screen test by one of two district level reading consultants who served as examiners. One consultant had received two weeks of special training at district expense in the administration of the test at the Gesell Institute in New Haven, Connecticut, in June, 1969. This person, in turn, trained the second examiner. Age equivalents scores were recorded using the categories of A and B as discrete points on a continuum of maturity level. A category of B indicated a measurably lower level of maturity than a category of A. However, in a few instances, examiners judged a subject to be between the A and B category and thus two levels might be reported (e.g., 4½A - 5B). Table 1 shows the number of scores falling into each category for forenoon and for afternoon sessions.

TABLE 1

Number of Children in Each Developmental Level Age Category

Developmental Level Age Category	Morning Session	Afternoon Session	Total
4½B	27	19	46
4½B-A	0	1	1
4½A	24	17	41
4½A-5B	8	10	18
5B	18	16	34
5B-A	4	6	10
5A	45	25	70
5A-5½B	2	2	4
5½B	2	9	11
5½B-A	12	0	12
5½A	0	6	6
Total	142	111	253

It was school policy that students be assigned to morning or afternoon sessions depending upon their residence in the community. There were five morning classes and five afternoon classes. Test scores for all forenoon children were stratified into the following groups: High = 5½A, 5½B, 5A, 5B, N=83 and Low = 4½A, 4½B, N=59.

Subjects were randomly selected from the appropriate strata to comprise two "High" developmental classes, one experimental and one control, two "Low" developmental classes, one experimental and one control, and one experimental heterogeneous class composed of subjects from both groups. It was necessary to select the heterogeneous control class from the afternoon session. Class size was controlled to not exceed 28 in each class.

Each afternoon child was randomly assigned on the basis of

GDPE score to one of the five afternoon classes. All afternoon classes were heterogeneous in organization and were controlled to not exceed 27 in each class.

Each of the five kindergarten teachers taught one morning class and one afternoon class. Slips of papers with names of the teachers were placed in a box and drawn randomly for assignment to the experimental High, Low, and Heterogeneous classes. The same procedure was used to assign remaining teachers to the High and Low control classes. In order to eliminate the possibility of teacher bias, it was decided that one of the two morning control class teachers should be teacher of the afternoon Heterogeneous control class. This teacher was randomly selected by drawing name slips from a box. The teacher identified to teach the afternoon Heterogeneous control was the one who taught the Low control in the morning session. Experimental and control groups are shown in Table 2.

TABLE 2

Experimental and Control Groups by Classroom

	EXPERIMENTAL			CONTROL		
Group	A	B	C	D	E	F
	High Homogeneous	Low Homogeneous	Heterogeneous	High Homogeneous	Low Homogeneous	Heterogeneous

Visual-Motor Programs and Procedures

Pre-School Workshop

A workshop sponsored by the Pullman School District and conducted by the project director, reading consultant, and kindergarten school principal was held on August 28, 31, and September 1, 1970. Focus was on the (1) concept of differentiated instruction, (2) significance of visual-motor competencies to total individual development and relationship to reading readiness, (3) components of individualized programs, (4) identification of materials already available in the district which would be appropriate for use in visuo-motor development, (5) development of a list of priorities for kinds of materials to acquire if and when funds became available, (6) instruction in the use of new materials, and (7) writing of pilot programs.

Since funds from outside sources did not become available until later in the year and since developments at the local level placed serious restrictions on the district budget, it was necessary to concentrate on developing programs for materials which were already available in the school or district, inexpensive self-constructed materials, and a limited supply of commercially available materials. The following procedures were used in the selection and construction of materials:

1. Identification through task analysis of visual-motor skills to be taught with subunits for each major skill.

2. Identification of behavioral objectives for each subunit with statement of performance criteria.

3. Determination of instructional strategies, including learner involvement, feedback, practice, and sequential development.

4. Selection of media and materials.

5. Development of evaluation procedures.

Identification of program areas and sample programs which grew out of the pre-school workshop are contained in Appendix A.

Mini-Course on Individualized Instruction

Implementation of the concept of differentiated instruction requires skills on the part of the teacher in organizing the classroom so that children can work on different tasks at different rates. Therefore, it was decided to have the kindergarten teachers participate in an inservice mini-course developed by the Far West Laboratory for Educational Research and Development entitled Organizing the Kindergarten Classroom for Independent and Small Group Instruction (1969). Special arrangements were made with the Far West Laboratory to offer the course in the fall of 1970. One condition for availability of the materials was that all of the kindergarten teachers participate in the program.

The course consisted of the following instructional sequences: Sequence I - Working Alone, Sequence II - Problem-Solving, Sequence III - Delayed Teacher Response, and Sequence IV - Introducing a New Activity Using Four Steps. Teachers were provided with a handbook containing explanatory material, including the performance objective and specified teacher behaviors for each sequence. The same procedure was followed for each sequence. First, teachers viewed an instructional videotape explaining the objective and behaviors. Next, they viewed a model lesson showing a teacher putting into practice the specific behaviors dealt with in the sequence. Checklists were provided for each of the above segments so that teachers could evaluate their understanding of what had been viewed. Teachers then prepared a 10 minute lesson for microteaching with a small group of their own pupils. Following the microteaching, the teacher viewed the lesson and critiqued it, using a form provided in the handbook. The following day, the skills practiced in the microteaching were put into use in the classroom. Teacher reaction to the entire course was highly favorable. Observations by the principal and project director showed that the specified teacher behaviors were maintained to a high degree throughout the year. The Mini-Course Schedule and Follow-up Evaluation can be found in Appendix D.

Programed Materials

The months of September through December, 1970, were spent developing and refining the programs which are contained in Appendix A. As commercially produced programmed materials became available, they were substituted for similar but less extensive components of the locally developed programs. By midyear, the visuo-motor program for the experimental classes was structured to encompass two major areas of development: Manipulative Perceptual and Fine Motor Perceptual. Components were as follows:

1. Manipulative Perceptual Tasks

    Geometric Inserts
    Inch Cubes
    Cubes in Perspective
    Large Parquetry
    Small Parquetry Designs I
    Small Parquetry Designs II
    Small Parquetry Designs III

    As Needed:
      Large and Small Bead Sequencing Boards
      Bolt Boards
      Winter Haven Perceptual Training Program

Programs for the Clear Stencils, Geometric Inserts, and Bead Sequencing were included in the locally produced package (see Appendix A). In cases where the need for additional reinforcement was indicated, portions of The Winter Haven Perceptual Training Program (1963) were used.

Each of the Cube Designs and Parquetry Designs Components consisted of two sets of materials: a series of cards on which were printed colored designs or outlines of designs which were to be constructed with wooden cubes or parquetry blocks and a box of 1 inch cubes or a box of parquetry blocks in assorted colors and shaped as triangles, diamonds, half-diamonds, and squares. Cards were sequenced from simple to complex. Entry levels were established for each component so that subjects could work at their own rate. After initial instruction, most children were able to work with a minimum of supervision. Description of program parts, local adaptations, and variations in use for each manipulative perceptual component identified above is shown in Appendix B. Included also are statements of performance objectives and examples of record sheets.

2. Fine Motor Perceptual Sequences

Dubnoff Sequential Perceptual-
Motor Exercises

As Needed:
Frostig Program for Development
of Visual Perception

The Dubnoff Program, Level 1 (1968) consists of a series of carefully sequenced exercises for developing fine eye-hand coordination. The program contains four sections: Straight Line Concept, Circular Concept, Diagonal Line Concept, and Intersecting Lines Concept. Exercises selected for inclusion in this study were those which dealt with the execution of vertical lines, horizontal lines, circles, squares, triangles, the straight line cross, oblique lines, and the vertical diamond. A total of 110 exercises were available for use with the experimental subjects.

For purposes of this research, entry levels were specified, practice exercises were identified, and success criteria were established for each section. Many of the enrichment activities suggested in the program manual were utilized for individual children and for small groups. These activities included 24 by 36 inch charts with acetate overlays for felt pen marking. The charts reproduced some of the activities which appeared on exercise worksheets and served not only as motivating devices, but they permitted children to find a comfortable place on the continuum of working from gross to fine motor coordination. Other exercises involved cutting and pasting, such as one about a balloon man in connection with the circle and one with cage bars in connection with the horizontal line. Samples of instructional systems and individual class records are contained in Appendix C.

Where additional fine motor-perceptual activities were indicated for mastery, selected exercises from the Frostig Visual Perceptual Program (1964) were employed.

Utilization of Technology

In order to permit children to progress at their own pace, to free the teacher for situations where adult supervision was necessary, and to provide for a variety of learning styles, a number of multimedia packages were used. An Audio-Flashcard Reader with commercially produced programs for visual discrimination was used with children who were judged to be deficient in listening skills, attention span, and visual discrimination. The Audio-Flashcard Reader, produced by Electronic Futures, Inc., North Haven, Conn., is similar to a Language Master. The following programs from the Reading Readiness Series, Likenesses and Differences, were used: Set 8-II, Colors, Shapes, Sizes; Set 9-III, Internal Detail, Direction; and Set 10-IV, Letters (Shelquist, Breeze, and Jacquot, 1967).

A 35 mm. slide-cassette tape package was designed to give subjects practice in making the Copy Forms of circle, square, triangle, straight line cross, rectangle, divided rectangle, horizontal diamond, and vertical diamond. Subjects were taught to operate the cassette recorder and slide projector. Complete directions for making the figures were given on an instructional tape as the steps for executing the form were projected on the wall. Subjects were also assisted by means of tape in evaluating their product. A second kit, the Mastery Copy Forms exercise, consisted of a set of slides showing only the completed forms with taped directions for making them. Scripts for the tapes may be found in Appendix D.

Organizational Considerations

The project director and teachers of the experimental classes met each week for a seminar at which student progress was reviewed and general procedures were evaluated. Individual student performance was analyzed continuously in order that a high degree of reliability in teacher judgment might be maintained. Teachers were urged to select materials which they felt would be appropriate to a given child at a particular time. There was no expectation that every subject would have experience with all of the materials. The large parquetry designs, for example, were used on a structured basis only with less mature children. This was also true of the Audio-Flashcard System. Parquetry Designs III and Blocks in Perspective were too difficult for many children, but extremely challenging to the most mature. Special tapes containing more detailed directions and recorded at a slower tempo were provided for the slide-tape Copy Form kits for children who had difficulty following the regular tape.

Null Hypotheses

Two sets of hypotheses were tested. Set I deals with developmental growth, and Set II deals with reading readiness. All hypotheses were tested at the .05 level of significance (see Table 2, p. 14, for classroom designations).

I. There is no statistically significant difference in developmental growth as measured by the Gesell Developmental Placement Examination at the end of eight months of instruction between:

   A. Kindergarten pupils in the experimental high development group and kindergarten pupils in the control high development group. (Groups A and D.)

   B. Kindergarten pupils in the experimental low development group and kindergarten pupils in the control low development group. (Groups B and E.)

C. Kindergarten pupils in the experimental heterogeneous development group and kindergarten pupils in the control heterogeneous development group. (Groups C and F.)

D. Kindergarten pupils in the experimental high and low development groups and kindergarten pupils in the experimental heterogeneous development group. (Groups A, B, and C.)

E. Kindergarten pupils in the control high and low development groups and kindergarten pupils in the control heterogeneous development group. (Groups D, E, and F.)

F. Kindergarten pupils in the experimental high and low development groups and kindergarten pupils in the control heterogeneous development group. (Groups A, B, and F.)

G. Kindergarten pupils in the control high and low development groups and kindergarten pupils in the experimental heterogeneous development group. (Groups D, E, and C.)

II. There is no statistically significant difference in reading readiness, as measured by the Gates-MacGinitie Readiness Skills Test, at the end of eight months of instruction between:

H. Kindergarten pupils in the experimental high development group and kindergarten pupils in the control high development group. (Groups A and D.)

I. Kindergarten pupils in the experimental low development group and kindergarten pupils in the control low development group. (Groups B and E.)'

J. Kindergarten pupils in the experimental heterogeneous development group and kindergarten pupils in the control heterogeneous development group. (Groups C and F.)

K. Kindergarten pupils in the experimental high and low development groups and kindergarten pupils in the experimental heterogeneous development groups. (Groups A, B, and C.)

L. Kindergarten pupils in the control high and low development groups and kindergarten pupils in the control heterogeneous development groups. (Groups D, E, and F.)

M. Kindergarten pupils in the experimental high and low development groups and kindergarten pupils in the control heterogeneous development group. (Groups A, B, and F.)

N. Kindergarten pupils in the control high and low development groups and kindergarten pupils in the experimental heterogeneous development group. (Groups D, E, and C.)

Data Collection

Two measures, the Gesell Developmental Placement Examination (GDPE) and the Gates-MacGinitie Readiness Skills Test, were administered to all kindergarten children during the first two weeks in June, 1971 as part of the district testing program for 1970-1971. Results were to be used by teachers and administrative personnel in making decisions regarding assignment of kindergarten children to first grade. Each subject in the experimental and control classes was posttested on the GDPE by the same examiner who had administered the pretest. Administration and scoring of the Gates-MacGinitie Readiness Skills Test was done by the classroom teacher.

The Gates-MacGinitie Readiness Skills Test consists of the following subtests: I. Listening Comprehension, II. Auditory Discrimination, III. Visual Discrimination, IV. Following Directions, V. Letter Recognition, VI. Visual-Motor Coordination, VII. Auditory Blending, VIII. Word Recognition. According to the Technical Supplement (Gates and MacGinitie, 1969), multiple regression techniques were used to determine the relative weight given to each subtest. Whole number approximations to the optimal weights were selected. A Total Weighted Score is obtained by multiplying the stanine score on each of the first seven subtests by the weight assigned to the subtest and summing the products. Median Kuder-Richardson formula 20 reliability coefficients for each subtest range from .63 (Auditory Blending) to .87 (Visual Discrimination). Correlations between Total Weighted Score on the Readiness Skills Test and standard scores on the Vocabulary and Comprehension subtests of the Gates-MacGinitie Reading Tests, Primary A, are reported at .60 and .59, respectively.

The test is administered in four parts of approximately one-half hour each with a rest period between parts. Parts 1 and 2 are given on one day and Parts 3 and 4 on another day. Testing is done with groups of not more than 15 children. In this study, one-half of the class, 14 children or less, was tested at one time while the remaining children were supervised elsewhere in the building or on the playground.

Statistical Treatment

Experimental and Control groups for each organizational level, Low, Heterogeneous, and High, were compared for equivalency by means of analysis of variance. Analysis of variance and covariance was employed to test the null hypotheses. The GDPE pretest was used as the covariate and the GDPE posttest and Gates-MacGinitie Readiness Skills Test were used for comparison purposes. In order to make a comprehensive analysis of visual-motor performance, analysis of variance was used to test for significance of the difference between means of the experimental and control groups at the three organizational levels, Low, Heterogeneous, and High, on Subtest VI, Visual-Motor Coordination, of the Gates-MacGinitie Readiness Skills Test. Chi-Square was used to compare performance of experimental and control groups on the Copy Forms portion of the GDPE. Computer services of the Washington State University Computer Center were utilized for data analysis.

Chapter III

ANALYSIS OF THE DATA

Introduction

Only those subjects for whom complete pre- and posttest data were available were included in the data analysis. Excluded were children who were administered the GDPE pretest after September, 1970, as well as those who transferred to a different classroom from the one to which they were originally assigned, and those who withdrew from kindergarten before the posttests were administered in June, 1971. Table 3 shows that 67 experimental subjects and 65 control subjects, for a total of 132 subjects, comprised the research sample.

TABLE 3

Number of Subjects in Each Comparison Group

Organizational Level	Experimental Group	Control Group
Low Developmental	19	20
Heterogeneous Developmental	25	21
High Developmental	23	24
Total	67	65

In order to permit statistical analysis, the GDPE age equivalents for all subjects in the sample were converted according to a numerical scale. Converted scores for recorded GDPE age equivalents are shown in Appendix E, Table 2.

Testing for Equivalency of Experimental and Control Groups by Level

Analysis of variance was employed to determine whether experimental and control groups for each organizational level, Low, Heterogeneous, and High, could be assumed to be from the same population. Comparisons were made on the basis of the GDPE pretest score, the measure upon which subjects were randomly assigned to organizational levels. Significance was specified at the .05 level of probability. Table 4 shows GDPE means and standard deviations for each group.

TABLE 4

GDPE Pretest Means and Standard Deviations
for Experimental and Control Groups

Group	N	Mean		Standard Deviation	
		Pre-	Post-	Pre-	Post-
Low Experimental	19	4.645	5.178	0.146	0.400
Low Control	20	4.700	5.325	0.164	0.291
Heterogeneous Experimental	25	4.990	5.640	0.245	0.283
Heterogeneous Control	21	5.054	5.625	0.270	0.321
High Experimental	23	5.332	5.859	0.158	0.197
High Control	24	5.344	5.818	0.178	0.221

A summary of the analysis of variance is presented in Table 5. Since, in each case, P values were greater than .05, no significant differences were shown between experimental and control groups for each organizational level. Thus, it was assumed that the two groups for each level were drawn from the same population.

TABLE 5

Summary of Analysis of Variance: GDPE Pretest

Source	SS	df	ms	F	P<
Low					
Between Groups	0.030	1	0.030	1.229	0.275
Within Groups	0.896	37	0.024	.....	.....
Heterogeneous					
Between Groups	0.046	1	0.046	0.702	0.407
Within Groups	2.890	44	0.066	.....	.....
High					
Between Groups	0.002	1	0.002	0.062	0.805
Within Groups	1.227	45	0.028	.....	.....

Testing the Null Hypotheses

Effects of Visuo-Motor Program on Developmental Growth

Set I of the null hypotheses dealt with the effects of a differentiated program in visuo-motor skills on developmental growth as measured by the GDPE. Analysis of variance was employed to test for significant differences between GDPE posttest scores for each comparison group. Results of the analysis of variance for each comparison group are presented in Tables 6, 7, and 8.

TABLE 6

Summary of Analysis of Variance: GDPE Posttest
Experimental and Control High Development Groups

Source	SS	df	ms	F	P∠
Between Groups	0.020	1	0.020	0.449	0.506
Within Groups	1.978	45	0.044	.....	.....

TABLE 7

Summary of Analysis of Variance: GDPE Posttest
Experimental and Control Low Development Groups

Source	SS	df	ms	F	P∠
Between Groups	0.212	1	0.212	1.743	0.195
Within Groups	4.491	37	0.121	.....	.....

TABLE 8

Summary of Analysis of Variance: GDPE Posttest
Experimental and Control Heterogeneous Development Groups

Source	SS	df	ms	F	P∠
Between Groups	0.003	1	0.003	0.028	0.867
Within Groups	3.979	44	0.090	.....	.....

No significant differences were found at the .05 level of probability, thus the following null hypotheses were accepted: There is no statistically significant difference in developmental growth as measured by the GDPE at the end of eight months of instruction between: I-A. Kindergarten pupils in the experimental high development group and kindergarten pupils in the control high development group, I-B. Kindergarten pupils in the experimental low development group and kindergarten pupils in the control low development group, and I-C. Kindergarten pupils in the experimental heterogeneous development group and kindergarten pupils in the control heterogeneous development group.

Effects of Organizational Pattern on Developmental Growth

In order to investigate the effects of different organizational patterns on developmental growth, the following hypotheses were tested: There is no statistically significant difference in developmental growth as measured by the GDPE eight months later between: I-D. Experimental high development, experimental low development, and experimental heterogdneous groups, and I-E. Control high development, control low development, and control heterogeneous groups.

Analysis of covariance was employed for statistical analysis with GDPE pretest as the covariate and GDPE posttest as the comparison measure. Tables 9 and 10 present a summary of the analysis of covariance.

TABLE 9

Summary of Analysis of Covariance: GDPE Posttest Minus Pretest
Experimental High, Heterogeneous, Low Development Groups

Source	SS	df	ms	F	P<
Among Groups	0.351	2	0.176	2.460	0.094
Within Groups	4.498	63	0.071	.....	.....
Regression	0.215	1	0.215	3.009	0.008**

**Significant at the .01 level of probability.

TABLE 10

Summary of Analysis of Covariance: GDPE Posttest Minus Pretest
Control High, Heterogeneous, Low Development Groups

Source	SS	df	ms	F	P<
Among Groups	0.331	2	0.116	2.247	0.114
Within Groups	4.498	61	0.074	.....	.....
Regression	1.207	1	1.207	16.362	0.001***

***Significant at the .001 level of probability.

There was no statistically significant difference in developmental growth at the .05 level of probability between the three organizational patterns, Low, Heterogeneous, and High Development, for either the experimental or the control groups. Thus, organizational pattern was not a significant factor in developmental growth. The regression for GDPE pretest on GDPE posttest for individuals was significant at the .01 level for experimental group comparisons and at the .001 level for control group comparisons.

Comparisons of Developmental Growth Under Homogeneous (High Development and Low Development) and Heterogeneous Organizational Patterns

In order to investigate further the effects of organizational patterns on developmental growth, the following hypotheses were tested: There is no statistically significant difference in developmental growth at the end of eight months of instruction between: I-F. Experimental high development, experimental low development (homogeneous), and control heterogeneous groups, and I-G. Control high development, control low development (homogeneous) and experimental heterogeneous groups.

Analysis of covariance was used to test for significant differences in developmental growth among all six groups. GDPE pretest was the covariate and GDPE posttest was the comparison measure. Table 11 summarizes results of the analysis of covariance.

TABLE 11

Summary of Analysis of Covariance: GDPE Posttest Minus Pretest for Six Comparison Groups

Source	SS	df	ms	F	P<
Among Groups	0.812	5	0.162	2.214	0.057
Within Groups	9.167	125	0.073	.....	.....
Regression	1.251	1	1.251	17.054	0.001***

***Significant at the .001 level of probability.

Results of the analysis of covariance showed no significant differences at the .05 level of probability. Hence, null hypotheses I-F and I-G were accepted. The regression of GDPE pretest on GDPE posttest for individuals was significant at the .001 level.

Effects of Visuo-Motor Program on Reading Readiness

Set II of the null hypotheses dealt with the effects of a differentiated program in visuo-motor skills on reading readiness as measured by the Gates-MacGinitie Readiness Skills Test (GMRST) at the end of eight months of instruction. Analysis of variance and analysis of covariance were used with the GDPE pretest as the covariate and the Gates-MacGinitie Readiness Skills Test (GMRST) as the comparison measure. Table 12 shows GMRST means and standard deviations for each group.

TABLE 12

Gates-MacGinitie Readiness Skills Test
Means and Standard Deviations

Organizational Level	Means	Standard Deviations
Low Experimental	71.947	12.808
Low Control	74.850	8.555
Heterogeneous Experimental	85.480	9.527
Heterogeneous Control	86.000	9.311
High Experimental	91.783	6.135
High Control	88.500	7.053

Analysis of variance was employed to test for significant differences between GMRST for each comparison group. Results of the analysis of variance for each comparison group are summarized in Tables 13, 14, and 15.

TABLE 13

Summary of Analysis of Variance:
Gates-MacGinitie Readiness Skills Test,
Experimental and Control High Development Groups

Source	SS	df	ms	F	$P<$
Between Groups	126.555	1	126.552	2.888	0.096
Within Groups	1971.916	45	43.820	.....	.....

TABLE 14

Summary of Analysis of Variance:
Gates-MacGinitie Readiness Skills Test,
Experimental and Control, Low Development Groups

Source	SS	df	ms	F	P∠
Between Groups	82.093	1	82.093	0.699	0.408
Within Groups	4343.488	37	117.392	.....	.....

TABLE 15

Summary of Analysis of Variance:
Gates-MacGinitie Readiness Skills Test,
Experimental and Control, Heterogeneous Development Groups

Source	SS	df	ms	F	P∠
Between Groups	3.087	1	3.087	0.035	0.853
Within Groups	3912.236	44	88.914	.....	.....

Results of analysis of variance showed no significant differences in reading readiness scores at the .05 level of probability for any of the three comparison groups. Further investigation of effects of the visuomotor program on reading readiness was made by application of analysis of covariance with GDPE pretest as the covariate and GMRST as the comparison measure. Tables 16, 17, and 18 summarize the analysis of covariance for each of the comparison groups.

TABLE 16

Summary of Analysis of Covariance:
GDPE Pretest and GMRST for Experimental and Control,
High Development Groups

Source	SS	df	ms	F	P∠
Among Groups	134.554	1	134.554	3.151	0.083
Within Groups	1878.734	44	42.699	.....	.....
Regression	93.181	1	93.181	2.182	0.147

TABLE 17

Summary of Analysis of Covariance:
GDPE Pretest and GMRST for Experimental and Control,
Low Development Groups

Source	SS	df	ms	F	P<
Among Groups	45.367	1	45.367	0.389	0.537
Within Groups	4195.977	36	116.555	.....	.....
Regression	147.511	1	147.511	1.266	0.268

TABLE 18

Summary of Analysis of Covariance:
GDPE Pretest and GMRST for Experimental and Control,
Heterogeneous Development Groups

Source	SS	df	ms	F	P<
Among Groups	6.089	1	6.089	0.094	0.761
Within Groups	2783.420	43	64.731	.....	.....
Regression	1128.816	1	1128.816	17.439	0.001***

***Significant at the .001 level of probability.

Results of the analysis of covariance for the three comparison groups showed no significant differences in reading readiness scores at the .05 level of probability. On the basis of the analysis of variance and analysis of covariance, the following null hypotheses were accepted: There is no significant difference in reading readiness as measured by the Gates-MacGinitie Readiness Skills Test at the end of eight months of instruction between II-H. Kindergarten pupils in the experimental high development group and kindergarten pupils in the control high development group, II-I. Kindergarten pupils in the experimental low development group and kindergarten pupils in the control low development group, and II-J. Kindergarten pupils in the experimental heterogeneous development group, and kindergarten pupils in the control heterogeneous group. The regression of GDPE pretest on GMRST for individuals in the homogeneous development groups was significant at the .001 level.

Effects of Organizational Pattern on Reading Readiness

In order to investigate the effects of different organizational patterns on reading readiness, the following hypotheses were tested: There is no statistically significant difference in reading readiness as measured by the GMRST eight months later between II-K. Experimental high development, experimental low development, and experimental heterogeneous groups, and II-L. Control high development, control low development, and control heterogeneous groups.

Analysis of covariance was employed for statistical analysis with GDPE pretest as the covariate and GMRST as the comparison measure. Tables 19 and 20 present a summary of the analysis of covariance.

TABLE 19

Summary of Analysis of Covariance: GMRST
Experimental High, Heterogeneous, and Low Development Groups

Source	SS	df	ms	F	P<
Among Groups	331.789	2	165.895	2.062	0.136
Within Groups	5068.715	63	80.456	.....	.....
Regression	890.381	1	890.381	11.067	0.001***

***Significant at the .001 level of probability.

TABLE 20

Summary of Analysis of Covariance: GMRST
Control High, Heterogeneous, Low Development Groups

Source	SS	df	ms	F	P<
Among Groups	319.287	2	159.644	2.530	0.088
Within Groups	3849.552	61	63.107	.....	.....
Regression	418.998	1	418.998	6.639	0.012*

*Significant at the .05 level of probability.

There was no statistically significant difference in developmental growth at the .05 level between the three organizational patterns, low, heterogeneous, and high development, for either the experimental or the control groups. Thus, hypotheses II-K and II-L were accepted, indicating that organizational pattern was not a significant factor in reading readiness. The regression of GDPE pretest on GMRST for individuals was significant at the .001 level for experimental group comparisons and at the .05 level for the control group comparisons.

Comparison of Reading Readiness Achievement Under Homogeneous (High Development and Low Development) and Heterogeneous Organizational Patterns

Further investigation of the effects of organizational patterns on reading readiness were made by means of analysis of covariance to test for significant differences in reading readiness among all six groups. GDPE pretest was the covariate and GMRST was the comparison measure. Table 21 summarizes results of the analysis of covariance.

TABLE 21

Summary of Analysis of Covariance:
GDPE Pretest and GMRST for Six Comparison Groups

Source	SS	df	ms	F	P<
Among Groups	850.922	5	170.184	2.369	0.043*
Within Groups	8978.582	125	71.829	.....	.....
Regression	1249.046	1	1249.046	17.389	0.001***

*Significant at the .05 level of probability.

***Significant at the .001 level of probability.

The regression of GDPE pretest on GMRST for individuals was significant at the .001 level. Results of analysis of covariance showed a significant difference at the .05 level of probability. The Scheffé test (Ferguson, 1966) was then employed to determine which groups in the comparisons specified in null hypotheses II-M and II-N contributed to the significance. Null hypothesis II-M stated that there is no significant difference in reading readiness after eight months of instruction between experimental high development, experimental low development, and control heterogeneous development groups. Null Hypothesis II-N stated that there is no significant difference in reading readiness after eight months of instruction between control high development, control low development, and experimental heterogeneous development groups. Table 20 summarizes results of the Scheffé test for the multiple comparisons specified by the null hypotheses. Values of F require for significance at the .05 and .01 levels, respectively, for df_1=5 and df_2=125 are 2.29 and 3.17. Values of F' required for significance at these levels are 11.45 and 15.85.

Table 22 shows that there was a significant difference in GMRST means when adjusted for developmental level between the experimental low development group and both experimental high development group and control heterogeneous development group. Hence, null hypothesis II-N was rejected. There was also a significant difference in GMRST means when adjusted for developmental level between control low development group and both control high development group and experimental heterogeneous development group. Hence, null hypothesis II-N was also rejected.

TABLE 22

Summary of Scheffé Test for Mean Differences on GMRST

Comparison Groups	F
Experimental High Experimental Low	56.957**
Experimental High Control Heterogeneous	5.105
Experimental Low Control Heterogeneous	27.413**
Control High Control Low	28.299**
Control High Experimental Heterogeneous	1.520
Control Low Experimental Heterogeneous	17.497**

**Significant at the .01 level of probability.

Analysis of Performance on Visual-Motor Subtests

In order to make a more comprehensive study of visual-motor performance on specific measures, comparisons were made between experimental and control groups on the Copy Forms subsection of the GDPE and GMRST Subtest VI, Visual-Motor Coordination.

The GDPE Copy Forms

The Copy Forms items are part of the pencil and paper subtest of the GDPE. Each item is appraised according to method of execution, as well as according to quality of the final product. Subjects were shown cards of seven geometric forms: circle, square, straight line cross, triangle, divided rectangle, horizontal diamond, and vertical diamond. Each form was given an age-level equivalent of 5 and below, 6, or 7 and above. For purposes of statistical analysis, age equivalent scores were converted to a scale of 1=age 5 and below, 2=age 6, and 3=age 7 and above. Chi Square was employed to compare performance on each Copy Form item for experimental and control groups at the three comparison levels:

high development, low development, and heterogeneous development. Results of the Chi Square analysis are summarized in Table 23.

TABLE 23

Chi Square Table: GDPE Copy Forms

Criterion	High			Low			Heterogeneous		
	Chi Square	df	Level of Sig.	Chi Square	df	Level of Sig.	Chi Square	df	Level of Sig.
○	0.295	2	.50	0.227	2	.90	2.056	2	.50
□	0.505	2	.80	0.218	2	.90	2.250	2	.30
+	0.0	2	...	1.893	2	.50	0.0	2	...
△	1.020	2	.70	5.671	2	.05	2.228	2	.50
⊠	12.435	2	.01	5.277	2	.10	13.886	2	.001
◊	5.242	2	.10	0.014	2	.99	2.807	2	.30
◇	0.019	2	.99	0.846	2	.70	1.500	2	.50

The divided rectangle was the most discriminating of the seven copy forms. It discriminated in favor of the experimental groups at the .001 level for the heterogeneous comparison, at the .01 level for the high development comparison, and at the .10 level for the low development comparison. The triangle discriminated at the .05 level in favor of the control group for the low development comparison. The vertical diamond discriminated at the .10 level in favor of the experimental group for the high development comparison.

Gates-MacGinitie Readiness Skills Test, Subtest VI, Visual-Motor Coordination

The Visual-Motor Coordination subtest measures skill in completing printed letters. Seven letters are shown as models and a part of each letter is printed in an adjoining column. Subjects are to complete each letter in the adjoining column. Each letter is scored 1, 2, or 3 according to criteria related to proportion, similarity to model, quality of lines, retracing, erasing, curvature of line, and orientation in space. Table 24 shows GMRST Subtest VI means and standard deviations for the six groups.

TABLE 24

GMRST Subtest VI, Visual-Motor Coordination Means and Standard Deviations

Organizational Level	Means	Standard Deviations
Low Experimental	6.158	2.292
Low Control	5.800	1.240
Heterogeneous Experimental	7.120	1.201
Heterogeneous Control	7.286	1.347
High Experimental	7.870	1.180
High Control	8.042	1.083

Analysis of variance was used to test for the significance of mean differences on the GMRST Subtest VI among six comparison groups. Table 25 summarizes the results.

TABLE 25

Summary of Analysis of Variance: GMRST Subtest VI for Six Comparison Groups

Source	SS	df	ms	F	P∠
Among Groups	86.296	5	17.259	8.622	.001***
Within Groups	252.219	126	2.002	.....	.....

***Significant at the .001 level of probability.

A difference at the .001 level of probability was found for Subtest VI. In order to test for significant differences among the six comparison groups when Subtest VI means were adjusted for developmental level, analysis of covariance was employed with GDPE pretest as the covariate and GMRST Subtest VI as the comparison measure. Table 26 summarizes results of the analysis of covariance.

Results of analysis of covariance showed no significant differences among the six comparison groups in performance on GMRST Subtest VI when means were adjusted for developmental level.

TABLE 26

Summary of Analysis of Covariance:
GDPE Pretest and GMRST Subtest VI for Six Comparison Groups

Source	SS	df	ms	F	P<
Among Groups	15.399	5	3.080	1.563	0.175
Within Groups	246.298	125	1.970	.....	.....
Regression	5.921	1	5.921	3.005	0.085

Chapter IV

SUMMARY AND CONCLUSIONS

Purpose of the Study

The purpose of the study was to seek answers to the following questions: (1) Can developmental growth, as measured by the Gesell Developmental Placement Examination (GDPE) at the kindergarten level, be accelerated by means of a specially designed, differentiated program? (2) Is the GDPE an effective instrument for inter-class grouping for instruction? and (3) Can readiness for reading, as measured by the Gates-MacGinitie Readiness Skills Test (GMRST) at the kindergarten level, be enhanced by a program of differentiated instruction in visuo-motor skills? In addition, the research sought to identify the kinds of materials and technology which might be useful in differentiating instruction in the kindergarten classroom.

Summary of Analysis of the Findings

Sample Selection and Procedures

Subjects were assigned by means of stratified random sampling on the basis of GDPE pretest to three experimental classrooms designated as high developmental level, low developmental level, and heterogeneous developmental level, and to three control classrooms designated as high developmental level, low developmental level, and heterogeneous developmental level. Results of analysis of variance showed no significant differences in performance on GDPE pretest between comparison groups at each developmental level. Hence, experimental and control groups at each level were assumed to be from the same population. Subjects in the experimental classes were exposed to a differentiated program of visuo-motor skills for a period of approximately eight months. The GDPE was administered as a posttest at the end of the experimental period as was the Gates-MacGinitie Readiness Skills Test (GMRST) of the Gates-MacGinitie Reading Tests. Two sets of hypotheses were tested. Set I dealt with developmental growth and Set II dealt with reading readiness. The .05 level of significance was set for hypotheses rejection.

Set I Hypotheses: Visuo-Motor Instruction and Developmental Growth

All Set I hypotheses were accepted. Set I hypotheses were as follows: There is no significant difference in developmental growth as measured by the GDPE at the end of eight months of instruction between kindergarten pupils in:

A. Experimental and control high development groups.

B. Experimental and control low development groups.

C. Experimental and control heterogeneous development groups.

D. Experimental high, experimental low, and experimental heterogeneous development groups.

E. Control high, control low, and control heterogeneous development groups.

F. Experimental high, experimental low, and control heterogeneous development groups.

G. Control high, control low, and experimental heterogeneous groups.

Set II Hypotheses: Visuo-Motor Instruction and Reading Readiness

The following Set II hypotheses were accepted: There is no statistically significant difference in reading readiness as measured by the GMRST at the end of eight months of instruction between kindergarten pupils in:

H. Experimental and control high development groups.

I. Experimental and control low development groups.

J. Experimental and control heterogeneous development groups.

K. Experimental high, experimental low, and experimental heterogeneous development groups.

L. Control high, control low, and control heterogeneous development groups.

The following Set II hypotheses were rejected: There is no statistically significant difference in reading readiness as measured by the GMRST at the end of eight months of instruction between kindergarten pupils in:

M. Experimental high, experimental low, and control heterogeneous development groups ($P < .01$).

N. Control high, control low, and experimental heterogeneous development groups ($P < .01$).

Performance on Specific Visual-Motor Measures

The visual-motor sections of the GDPE and the GMRST were subjected to statistical analysis. No significant differences were found on GMRST Subtest VI, Visual-Motor Coordination, between experimental and control groups for each developmental level, high, low, and heterogeneous.

Performance on each of the seven GDPE Copy Forms (circle, straight line cross, square, triangle, divided rectangle, horizontal diamond, and vertical diamond) was analyzed by comparing experimental and control groups at each developmental level. For the divided rectangle, differences were found at the .001 level of probability in favor of the experimental heterogeneous development group, at the .01 level for the experimental high development group, and at the .10 level for the experimental low development group. For the triangle, differences at the .05 level of significance were in favor of the control group for the low development level. The vertical diamond showed differences at the .10 level of significance in favor of the experimental high development group.

Limitations of the Study

The following limitations of the study must be recognized in considering the outcomes of the research:

1. The school population contained only a small number of children of low socioeconomic status and even fewer who could be considered economically disadvantaged. Students were primarily children of faculty, staff, and students at Washington State University, although there were also children of business people, farmers, professionals, and non-university civil servants.

2. Because federal funds did not become available until February, 1971, the visuo-motor program developed more slowly than had been anticipated. Constraints on the school district budget were exceptionally severe at the time that the research was being initiated so that this source of assistance was restricted as well. These financial restrictions limited not only the availability of materials but affected the development of the technological components in that neither the necessary equipment nor the personnel were available when the need was most critical. Other materials, therefore, were substituted in the program. The multi-media components were postponed until later in the year and their development and emphasis were somewhat more limited than had been anticipated.

3. There was little control over teacher variable since there were only five kindergarten teachers. Four of the five teachers were experienced at the kindergarten level while the fifth, teacher of a control classroom, was in her first year. The housing of all kindergarten classes in the same building and the tradition among the teachers of sharing resources and talents increased the possibility of contamination between experimental and control classes.

4. The GDPE, which served as the basis for selection of developmental groups and as the measure for determining developmental growth, is of recent origin in its present form (1964). Although

it is receiving increasing attention from educators, it is in limited use at this time. The standardization sample for the instrument is small and of limited diversity in socioeconomic status. The intervals by which GDPE scores are reported restricts the spread. Had a more sensitive instrument been available, greater spread in scores might have yielded different results. This was a particularly important consideration with a population limited in diversity.

Discussion of Findings Related to Developmental Growth

The effects of a visual-motor program on developmental growth were not apparent in a statistical sense in the results of this research. Some of the factors which may have affected the program were identified in the limitations specified above. It has been pointed out that financial limitations necessitated the identification and adaptation of some materials which were already available in the district. Some of these materials (beads, blocks, dominoes) were standard equipment to a greater or lesser degree in all classrooms although they were not used in any individualized, sequential fashion in the control rooms. Benefits which may have accrued to the experimental subjects from exposure to these materials by means of the systematic, performance-based programs which grew out of the preschool workshop, were not measured by the posttest instruments to a degree sufficient to yield statistical significance. On the other hand, the Dubnoff Perceptual Motor Exercises, the various levels of cube block and parquetry materials, the Audio-Flashcard Reader and the slide-tape programs were available only to the experimental classes. Thus, contamination to control classes was virtually non-existent for that part of the program.

It is difficult to determine whether the presence of the investigator in the building and the knowledge that a special visuo-motor program was in operation affected in subtle ways the visual-motor types of activities in the control rooms. However, it was this investigator's observation that, for at least the major portion of the experimental period, no special efforts were made in the control rooms to carry out anything beyond the normal activities associated with a balanced kindergarten program. It should be pointed out that, while there were some disadvantages in having all project classes in the same building, there were also advantages. Thus, the investigator was able to keep in close touch with all facets of the program at all times, it was convenient for teachers to consult with one another as new ideas presented themselves, and meetings and conferences were easily scheduled so that the program did not become a burden to teachers.

As district and federal funds became available, additional materials were acquired and new programs developed. During the latter half of the experimental period, teachers reflected, not on the dearth of materials, but on the difficulty of finding time for children to use them. As a result, the teachers felt that for some children, the program became more intensive than was desirable. This was most apparent with the slower paced children who needed "branching" kinds of practice and who seemed to thrive on a more leisurely pace of instruction. Had certain facets of the program been in operation earlier in the year, aspects of individualization could have been carried out with greater success. Teachers were particularly conscious of the time factor because of the expansion of the total kindergarten curriculum during the 1970-71 school year. The new activities included a special physical education program, several levels of pre-reading and early reading instruction for children who were ready for it, some special projects with the district art consultant, and guidance activities for small groups of children. The movement of children in and out of these programs tended to limit the time left for activities being directed by the classroom teacher. The curriculum expansion did not affect the visuo-motor research directly, however, since all classrooms were equally exposed to new developments.

Examination of the data on GDPE means and standard deviations (Table 4, page 22) reveals that all control groups had slightly higher GDPE pretest scores than did the experimental groups for each comparison level. Pretest standard deviations were also somewhat higher for all control groups. However, mean posttest scores and mean gains (GDPE posttest minus pretest) were greater for the experimental groups for high development and for heterogeneous development. The control low development group had a higher mean gain than did the experimental low. The larger mean gains for the experimental high and the experimental heterogeneous raise two questions which were not answered by this research: (1) Is there a ceiling on developmental growth so that most children in the high group and a substantial number of children on the heterogeneous group would have achieved their potential growth by the end of the year or earlier? and (2) In practical application, is the GDPE more useful in identifying gross deviations from an expected norm rather than in arriving at a level anywhere along a continuum of developmental growth regardless of chronological age?

Differences between experimental and control groups on the posttest standard deviation were negligible except for the low development level comparison. The larger posttest standard deviation for the experimental low group, that is, the increase in spread from pre to post, suggests that the visuo-motor program might have been effective for some low development children, but not for others. These data would seem to lend support to the teachers' observations regarding the slower paced children.

Discussion of Findings Related to Reading Readiness

There were no significant differences between experimental and control groups on the GMRST. Thus, it was concluded that the visuo-motor program had no significant effect on reading readiness as measured by the test. In fact, mean differences for the experimental and control groups at the low and homogeneous levels, though negligible, were in favor of the control groups. For the high development level, where one might have expected to find a ceiling effect, the mean difference ($p < .096$) was in favor of the experimental group. When means were adjusted for developmental level, analysis of covariance showed differences at the .08 level of probability in favor of the experimental group.

The readiness test, which had previously been used in the district, included two out of six subtests which were described in the manual as measuring visual perception and motor control. It had been the investigator's intent to use that test for purposes of the research study. However, the district had adopted the GMRST, a measure in which only Subtest VI out of seven subtests is in the visual-motor category. The only alternative to using GMRST in the study would have been to administer two readiness tests, a move which obviously could not be seriously considered, especially for children of this age.

Discussion of Performance on Specific Visual-Motor Measures

Performance on the GDPE Copy Forms was rated 1, 2, 3, from low to high. Effects of training in copying geometric forms were most apparent in the heterogeneous and high development groups where five of the seven copy forms yielded a higher percent of ratings of 2 and 3 (1 was the lowest rating) for the experimental groups. Four of the high rated copy forms (circle, square, divided rectangle, vertical diamond) were common to both levels. In the low development comparison, the experimental group had a higher percent of 2 and 3 ratings on the cross, divided rectangle, and horizontal diamond while the control group was favored on circle, square, and triangle and the two comparison groups were tied on horizontal diamond ratings.

Only three copy forms (triangle, divided rectangle, and vertical diamond) received three ratings at any level. The divided rectangle received three ratings at all levels and for both experimental and control groups, but with a higher percent of 3's at each level for the experimental group. This form discriminated at the .001 level of probability for the heterogeneous experimental group, .01 level for the high experimental group, and .10 for the low experimental group. According to Ilg and Ames (1965, p. 95), the divided rectangle is the most demanding of the geometric forms, and therefore it is noteworthy that it can be readily taught. It is a form which appears complicated but lends itself well to simple sequencing of steps by means of 35 mm. slides. It was taught by using a slide-cassette tape program, the script of which appears in Appendix D. For each step, there was a 35 mm. slide to illustrate where the line was to be placed. Colored dots, consistent with the system used in the Dubnoff program, indicated starting points while arrows indicated line direction. The divided rectangle was the only geometric form which was not included in the Dubnoff Program or dealt with in some other materials, so all instruction was given with the slide-tape program. Although the slide-tape copy forms program was not used until spring, it was an activity which seemed to intrigue children at all developmental levels, partly because of the technology and also because of the ease with which the program led to success in making what was referred to as a "spider web."

The vertical diamond is an item at the 7-year-old level on the Binet Intelligence Test. As might be expected, it discriminated in favor of the experimental high development subjects ($p < .10$). Ratings of 3 for the triangle were mixed among levels. In the low development comparison, the only 3's were given to subjects in the control group. No clear explanation is evident for the finding that the triangle discriminated at the .05 level in favor of the control group. In the heterogeneous comparisons, a higher percent of control subjects were rated 3 on the vertical diamond than were experimental subjects. For the high development comparisons, however, the percent of 3 ratings on this form was greater for the experimental group.

Although copy forms are reported to correlate highly with visual discrimination and with performance on reading tests (DiMeo, 1967), it is not known whether this relationship holds when the forms have been systematically taught. Although no correlations were computed with total GDPE, it appears from the results of the Chi Square analysis that success is related to maturational level. It also appears that maturational or developmental growth can be accelerated on copy forms by intensive, carefully programed practice with self-instructional materials. It would be useful to measure retention on an item such as the divided rectangle for which training yields dramatic results.

It was expected that there would be significant differences among all six comparison groups on the GMRST Subtest VI, Visual-Motor Coordination. However, when means were adjusted for developmental level, no significant differences were found. Mean differences between comparison levels were negligible, but favored the control group at the low developmental level and experimental groups at the high and heterogeneous developmental levels. A conclusion drawn is that abilities measured by the copy forms are not the same as those measured by GMRST Subtest VI.

Discussion of Findings Related to Organizational Patterns

Results of this research gave little support for GDPE based homogeneous grouping over heterogeneous grouping. No significant differences were found between any groups on developmental growth as measured by GDPE pretest, posttest gains. There was a statistically significant difference ($p < .01$) on the GMRST between three groups: experimental low, experimental high, and control heterogeneous, even when means were adjusted for developmental level. Comparisons between control low, control high, and experimental heterogeneous on the GMRST with means adjusted for developmental level yielded similar results ($p < .01$). In both comparisons, differences were in favor of the high development and the heterogeneous development groups over the low development groups. Thus, results of this investigation showed no advantage in placing low development children in one group. This finding was supported by judgments of teachers of both low development groups. These teachers felt that while there might be certain instructional advantages in decreasing the range of characteristics in the classroom, there were disadvantages inherent in such an organizational pattern. The major disadvantage cited by the teachers was the absence of models for low development children. The kind of models referred to were present in the afternoon heterogeneous classes taught by the same teachers. In those classes, teachers felt that low development children benefitted in language and concept development by interaction with more mature children. They indicated also that in their judgment, heterogeneous classes contained children who provided models for acceptable behavior as well.

Although there appeared to be no achievement disadvantages to developmental placement for the high development children, teacher judgment again indicated that practical disadvantages outweighed possible advantages. Teachers of these groups acknowledged that a relatively homogeneous class of more mature children permitted breadth and depth in many curriculum areas. However, the more mature children tended to be egocentric, critical of one another, and generally intolerant of anyone who was lacking in proficiency. Being highly competitive, they were inclined to deprecate one another's performance. Teachers of the high development classes felt that the high development children who were in the afternoon heterogeneous class had quite different attitudes about sharing and about assisting others. One of the teachers reported that it was easier to differentiate instruction in her heterogeneous groups because of the greater range in characteristics. She indicated that it was easier for her to identify appropriate bases for grouping when there was a mix of independent and dependent children. Some high development in the homogeneous groups were so demanding of teacher time that it was sometimes difficult to determine when they were unable to work independently and when they were simply unwilling to do so.

Other Reactions and Observations

Developmental Placement

There were mixed reactions concerning the value of the development placement examination regardless of whether or not it was used for grouping purposes. The experienced teachers reported that within the first two weeks that school was in session, they were able to arrive at a judgment consistent with that yielded by the GDPE. Their observations support Ilg and Ames (1965) who report 83 percent teacher agreement with GDPE scores at kindergarten level. However, questions must then be raised about whether the time and personnel costs required for developmental placement testing can be justified if the results are used only for assessments that a teacher can make during the first two weeks of school. Deal and Wood (1968) point out that the concept of school readiness (which is basic to GDPE) is somewhat outdated in view of the fact that many children have attended preschool programs so that information about them should be available.

The GDPE is extremely limited as a diagnostic tool since the score only indicates how a child's performance on certain tasks compares with those of other children his or her age. Deal and Wood (1968, p. 16) state, "The concept of school readiness . . . must be replaced by diagnostic tests of specific skills which will give a basis for planning individualized programs."

The notion that a child must have achieved a certain standard of development before he or she is ready to enter kindergarten implies that the kindergarten curriculum is discrete and fixed. Therefore, the child must fit the curriculum; the curriculum cannot change to accommodate the child. Such a position is contrary to what is known about the proportion of cognitive development, given adequate stimulation, which takes place in the preschool and early primary years. It is also in direct conflict with current expectations that the curriculum should be designed to serve the students and that instruction should be geared to the individuals in a classroom.

The above considerations are not to suggest that the GDPE has no value in the school setting. It can serve as an additional assessment tool for occasional instances where a measure of the child's developmental level will add information useful for studying a problem or useful in making an educational decision. It appears doubtful, however, that its value justifies mass screening of a normal population of children.

Although parental reaction probably depends largely on the kind of communication which is done regarding developmental placement examination, parents are generally dubious about tests which tend to be regarded as "entrance exams" to kindergarten. It might be better to incorporate useful parts of the GDPE, such as the Copy Forms, into an assessment battery which teachers would use as they saw fit early in the school year and at appropriate times during the year.

The Visuo-Motor Program

Some teacher observations about the visuo-motor program have been discussed in earlier sections. In general, teachers said that the program was useful to the students and helped to sensitize the teachers to the visual-motor characteristics and needs of their pupils. Teachers also reported that performance with certain programs tended to carry over to other tasks.

The Dubnoff exercises were to repetitive for some children. It would be desirable to embark on such a program earlier in the year so that more of the creative activities related to its various components could be utilized. Interest remained high in the parquetry and cube block design programs throughout the experimental period. These materials lent themselves well to self-pacing and to working on an independent basis. Geometric inserts and stencils also received sustained interest from the students. Although no firm conclusions can be drawn, the statistical evidence coupled with teacher reaction suggests that the program might have been too highly structured for low development children.

Use of Technology in Kindergarten

All groups responded with enthusiasm to the technology which was introduced into the program. Special tapes needed to be made for the low development level group because directions were too complex at first and the pacing was too fast for some children. On the other hand, the pacing was sometimes too slow for high development children so that they became somewhat impatient. These observations suggest that even "packaged" self-instructional programs need to be differentiated in pacing and complexity. Children in the heterogeneous and high development groups had no difficulty operating the carousel projector and the cassette tape recorder even to the point of rewinding the tape in preparation for the next user. Low development children had more difficulty handling equipment. The task of operating media, watching slides, listening to directions, and reproducing forms on paper was a task which many, but not all of them could master.

One can conclude that slide-tape learning kits are useful for most kindergarten children in teaching specific visual-motor skills and might well be employed for other purposes as well. The Audio-Flashcard Reader, a language master type of equipment, was well received and easily operated by low development children. It should also be considered for differentiating instruction in a variety of areas.

Conclusions and Recommendations

The following conclusions must be considered in light of the limitations of (1) a sample drawn from an above average intellectual and socioeconomic population, (2) lack of control over teacher variable, (3) limited standardization of the GDPE, and (4) restrictions on available funds for initiating the experimental program.

Although differentiated instruction in visuo-motor skills seems to be beneficial for some children, the effects on reading readiness examined in this research do not justify large expenditures of time and money for this purpose. Children at average and high developmental levels seem to benefit more than those at lower developmental levels. It is possible that the inclusion of visual-motor activities in a well-balanced kindergarten curriculum may enable most children to progress as much as they are able to in these skills.

Findings of this research give little support to the feasibility of accelerating of total developmental growth by means of differentiated instruction in visuo-motor skills. Mean developmental growth gains tended to favor experimental groups, but not to the point of statistical significance. It is possible, however, to accelerate development as measured by certain copy forms so that children are performing at a level significantly beyond developmental expectations. Further study needs to be made of the extent to which such acceleration is maintained, and of the relationship between performance on selected copy forms and performance on various reading measures.

High and heterogeneous developmental level groups, experimental and control, had significantly higher reading readiness test means, even when adjusted for developmental level, than did both low groups. A conclusion drawn is that the organizational pattern on the basis of developmental age is more of a disadvantage for the low developmental level than for either high developmental and heterogeneous groups.

Grouping for instruction on the basis of developmental age has limitations similar to those associated with homogeneous grouping based on other measures. Although Ilg and Ames (1965) do not report correlations with IQ, they do point out that in the GDPE norming studies, children who were judged "most ready" by teachers had higher IQ's than those judged to be "not ready." In actual practice, there is an unfortunate tendency to associate "high developmental level" with high intelligence and "low developmental level" with low intelligence. The above considerations supported by observations of teachers and the investigator, indicate that grouping on the basis of developmental age actually, as well as practically, may not be different from ability grouping.

Measures which have diagnostic value with implications for curriculum development are more useful at the kindergarten level than are measures which are designed to determine the extent to which children at a given age have characteristics similar to other children of that age.

Carousel slide-cassette tape programed packages are useful types of self-instructional media for kindergarten children. Further study needs to be made of the kinds of programs best suited to such media. Programs utilizing language master types of technology also appear to be appropriate for differentiating instruction in kindergarten.

BIBLIOGRAPHY

Ames, Louise Bates. "Children With Perceptual Problems May Also Lag Developmentally," Journal of Learning Disabilities, II (April, 1969), 205-208.

Austin, M. C. and Morrison, C. The First R: The Harvard Report on Reading in Elementary Schools. New York: Macmillan, 1963.

Baller, Warren R. and Charles, Don C. The Psychology of Human Growth and Development. New York: Holt, Rinehart, and Winston, Inc., 1968.

Baltimore City Public Schools. An Early School Admissions Project Related to Interschool Learning Activities and Experiences for Culturally Deprived Children. 1962.

Bloom, Benjamin S. Stability and Change in Human Characteristics. New York: John Wiley and Sons, Inc., 1964.

Bosworth, Mary H. "Pre-Reading: Improvement of Visual-Motor Skills." Ed.D. thesis, University of Miami, 1967.

Bragdon, Sue R. "A Book Review," Journal of Home Economics, LVII (1965), 472.

Buros, Oscar Krisen, editor. The Third Mental Measurement Yearbook. Highland Park, New Jersey: The Gryphon Press, 1949.

Deal, Therry N. and Wood, Paul L. "Testing the Early Educational and Psychological Development of Children--Ages 3-6," Review of Educational Research, XXXVIII (February, 1968), 12-18.

DeHirsch, Katrina. Predicting Reading Failure: A Preliminary Study of Reading, Writing, and Spelling Disabilities in Preschool Children. 1st edition. New York: Harper & Row, 1966.

DiMeo, Katherine Pappas. "Visual-Motor Skills: Response Characteristics and Pre-Reading Behavior." Ph.D. thesis, University of Miami, 1967.

Education Policies Commission. "Begin Public Education at the Age of Four," The Education Digest, XXXII (1966), 1-4.

Fabian, A. A. "Vertical Rotation in Visual-Motor Performance--its Relationship to Reading Reversals," Journal of Educational Psychology, XXXVI (March, 1945), 129-154.

Falik, Louis H. "The Effect of Special Perceptual-Motor Training in Kindergarten on Reading Readiness and on Second Grade Reading Performance," Journal of Learning Disabilities, II (August, 1969), 395-402.

Ferguson, George. Statistical Analysis in Psychology and Education. New York: McGraw-Hill, 1966.

Foster, J. C. and Headley, N. E. Education in the Kindergarten. 4th edition. New York: American Book Company, 1966.

Frostig, Marianne. "Disturbances in Visual Perception," Journal of Educational Research, LVII (November, 1963), 160-162.

Frostig, Mariane and Horne, David. The Frostig Program for the Development of Visual Perception. Chicago: Follett Publishing Company, 1964.

Gates, Arthur I. and MacGinitie, Walter H. Technical Supplement to Teacher's Manual, Gates-MacGinitie Reading Tests, Readiness Skills. New York: Teacher's College Press, 1969.

Goins, Jean Turner. Visual Perceptual Abilities and Early Reading Progress. Chicago: University of Chicago Press, 1958.

Goldberg, Miriam and Hottenlocker, Janellen, editors. Readings in Psychology of Learning. New York: Selected Academic Readings, Inc., 1966.

Good, Carter V. "Gesell Developmental Schedules," The Third Mental Measurement Yearbook. Edited by O. K. Buros. Highland Park, New Jersey: The Gryphon Press, 1949.

Goodlad, John and Anderson, Robert. The Non-Graded Elementary School. New York: Harcourt, Brace & World, 1963.

Gray, Susan and Klaus, Rupert. "An Experimental Preschool Program for Culturally Deprived Children." Child Development, XXXVI (1965), 886-898.

Hendrickson, Lois N. and Muehl, Siegmar. "The Discrimination of b and d in Kindergarten Children," Readings in the Psychology of Childhood and Adolescence. Edited by William J. Meyer. Waltham, Mass.: Blaisdell Publishing Company (1967), 114-122.

Hillerich, Robert L. "Pre-Reading Skills in Kindergarten: A Second Report," The Reading Teacher, XVII (1965), 312-317.

Hymes, James L., Jr. "Why Programs for Young Children," Today's Education, LIX (1970), 34-36.

Ilg, Frances L. and Ames, Louise. School Readiness. New York: Harper & Row, 1965.

Jensen, Arthur L. "How Much Can We Boost I.Q. and Scholastic Achievement," Harvard Educational Review, XXXIX (Winter Edition, 1969), 113-138.

Keim, Richard P. "Visual-Motor Training, Readiness, and Intelligence of Kindergarten Children," Journal of Learning Disabilities, III (May, 1970), 256-259.

Lavatelli, C. B. "Critical Overview of Early Childhood Education Programs," U.S. Office of Education, ERIC No. ED 019 142, 1968.

Leeper, Sarah; Dales, Ruth; Skipper, Dora; and Witherspoon, Ralph. Good Schools for Young Children. 2nd edition. New York: The Macmillan Company, 1968.

Lindberg, L. "A Book Review," Instructor, LXXIV (1965), 31.

Logan, Lillian M. Teaching the Young Child. Boston: Houghton Mifflin Company, 1960.

Lowder, Robert G. "Perceptual Ability and School Achievement: An Exploratory Study." Ph.D. thesis, Purdue University, 1956.

Milligan, Jerry L. "A Study of the Effects of a Group Language Development Program Upon the Psycholinguistic Abilities of Normal Kindergarten Children." Unpublished Ed.D thesis, University of Kansas, 1966.

Mindees, Mary M. and Keliher, Alice V. "Review of Research Related to the Advantages of Kindergarten," Childhood Education, XLIII (1967), 83-96.

Monroe, Marion. "Causative Factors in Reading Disabilities," Reading Disabilities: Selections on Identification and Treatment. Edited by Harold Newman. New York: The Odyssey Press (1969), 51-55.

Mussen, P. H.; Conger, J. J.; and Kagan, Jerome. Child Development and Personality. New York: Harper & Row, 1969.

National Education Association. "Kindergarten Education in Public Schools, 1967-68," Research Report 1969-R6, Washington, D.C.: NEA Publications, 1969.

Oettinger, Anthony, and Sema, Marks. "Educational Technology: New Myths and Old Realities," Harvard Educational Review, XXXVIII (Fall, 1968), 697-717.

Olson, Leroy C. "The Effects of Non-Public School Kindergarten Experience Upon Pupils in First Grade." Ed.D. thesis, Pennsylvania State University, 1962.

Organizing the Kindergarten for Independent Learning and Small Group Instruction. Berkeley: Far West Laboratory for Educationsl Research and Development, 1969.

A Perceptual Training Procedure for Beginning School Children, Procedure Manual. Winter Haven, Florida: The Star Press, 1963.

Phillips, John L. The Origins of Intellect: Piaget's Theory. San Francisco: W. H. Freeman and Company, 1969.

Prichett, Karen and Ogemann, Ralph. "Piaget and the Role of Guided Experiences in Human Development," Human Development: Readings in Research. Edited by Ira J. Gordon. Palo Alto, California: Scott, Foresman Company (1965), 184-192.

Research for Better Schools, Inc. Individually Prescribed Instruction. Philadelphia, 3-4.

Roche, Helen. "Junior Primary in the Van Dyke Level Plan," Journal of Educational Research, LV (February, 1962), 232-233.

Sapir, Selma G. and Wilson, Bernice. "A Developmental Scale to Assist in the Prevention of Learning Disability," Educational and Psychological Measurement, XXVII (1967), 1061-1068.

Sheldon, W. D. and Lashinger, D. R. "A Summary of Research Studies Relating to Language Arts in Elementary Education: 1963," Elementary English, XXXVII (1969), 866-885.

Shelquist, Jack, Breeze, Barbara; and JacQuot, Bette. "Reading Readiness Series," Audio Flashcard. North Haven, Conn.: Electronic Futures, Inc., 1967.

Sigal, I. E. "The Attainment of Concepts," Review of Child Development Research: Volume I. Edited by Hoffman and Hoffman. New York: Russell Sage Foundation, 1964, 196-216.

Singer, Harry; Balow, Irving; and Dahms, Patricia. "A Continuum of Teaching Strategies for Developing Reading Readiness at the Kindergarten Level," Forging Ahead in Reading: Proceedings of the Twelfth Annual Convention. Vol. 12, Part 1. Edited by J. Allen Figurel. Newark, Delaware: International Reading Association (1968), 463-467.

Smith, Henry P. and Dechant, Emerald. Psychology in Teaching Reading. Englewood Cliffs, N.J.: Prentice-Hall Publishing Co., 1964, 12-19.

Stanchfield, Jo M. "The Development of Pre-Reading Skills in an Experimental Kindergarten Program," Educational Horizons (Winter, 1970-71), 57-62.

Tyler, Frederick T. "Readiness," Encyclopedia of Educational Research. 4th edition. Edited by Robert L. Ebel. Toronto: The Macmillan Company, 1969, 1066.

A Voice for Children. III (1970), 4.

APPENDIX A

LOCALLY PRODUCED PROGRAMS

Skill: Development of Dominant Handedness

BEHAVIORAL OBJECTIVES	STRATEGIES
Given an object or task, the child will show gross motor dexterity in use of dominant hand.	1. Play games with bean bags, such as: a. "Monkey See, Monkey Do" (Prerequisites: Introduce bean bag use. Create opportunities to experiment with handling.) b. Tossing bean bag at target 2. Toss used juice cups into wastebasket. 3. Play catch with yarn balls. 4. Play catch with various sized rubber balls.
Given an object or task, the child will show fine motor dexterity in use of dominant hand.	1. Thread and unthread a nut and bolt in place. Thread and unthread all nuts in place. 2. Remove a nut and bolt. Thread and unthread out of the board. 3. Re-insert nut and bolt. Thread so the bolt is firm. (Prerequisites: Introduce bolt board. Encourage child to experiment with it. Have the child use the board facing both directions. Note the effect of grasping the bolt vs. not grasping it while threading and unthreading.)

EVALUATION	RESOURCES
When throwing a ball or bean bag, the child will show dominant handedness by throwing with his dominant hand 4 out of 5 times.	Bean Bags Yarn Balls Various Sized Rubber Balls Juice Cups
Using a nut and bolt, the child will demonstrate dominant handedness by performing the turning manipulations on the bolt board with the dominant hand.	Bolt Board - nuts, washers, bolts Build-a-Toy Fingerpainging Easel Painting Tog'l Toy Pegboard Beadstringing

Skill: Drawing and Writing

BEHAVIORAL OBJECTIVES	STRATEGIES
1. Given a #2 pencil and piece of paper and requested to "make anything you want," the child demonstrates his ability to hold the pencil by grasping it firmly with the thumb and index finger.	Provide the child with experiences in holding crayons, chalk, and pencils. Allow complete freedom in his expression as he uses these tools. Aid him in his grasp of the tool only if he exhibits difficulty and/or improper grasp.
2. Given a #2 pencil and sheet of 8½ x 11 plain paper, and requested to "make this" when presented with a visual stimulus card, the child is able to execute both vertical and horizontal lines, the finished products showing motor control by being firm and not "wavy."	1. Provide the child with developmental experiences as programmed in the Dubnoff School Program/1, Level 1. 2. Provide the child with frequent experiences in making vertical and horizontal lines on a blank sheet of paper (free of visual stimuli, as starting and stopping points.). 3. Provide worksheets which provide models and visual stimuli for practicing control. a. Vertical: VM: Exercises 41-48, VM Ex. 65. b. Horizontal: VM: Exercises 49-58, VM Ex. 66. Manual, page 110.

EVALUATION	RESOURCES
Same as objective.	Paper Crayons Chalk Pencils
Same as objective.	Dubnoff School Program/1, Level 1 from Teaching Resources 100 Boylston Street Boston, Massachusetts Frostig Materials Visual Motor Skills

BEHAVIORAL OBJECTIVES

3. Given a #2 pencil and a sheet of 8½ x 11 drawing paper, and when presented with the visual stimulus (card on which outline of shape is printed) and requested to "draw this," the child is able to successfully execute a:
   a. Circle
   b. Cross

STRATEGIES

1. Templates: The use of templates aids the child in learning to "feel" line movements. Presenting him first with the circle template, allow him to trace, beginning at the top along the inside edges with his index finger. Then allow him at the chalkboard to use chalk and trace around the inside edge. When he demonstrates competency, allow him to use the templates at his desk following the same procedure with paper, tracing first with his finger and then with a pencil.

2. Walking-out-shapes: The child gains further feeling for shapes when allowed to walk them out! The shape may be drawn on the floor or a piece of large butcher paper to provide a visual stimulus. They may also walk the pattern from memory, without the aid of a visual drawing.

3. Provide the child with opportunities to draw, free hand, the shape to be mastered. Emphasize "begin at the top!"

4. When the child demonstrates competency, provide worksheets which add a visual stimulus and require the child to draw, free hand, shapes at defined points in drawing.
   a. Traffic light: put the lights on the signal.
   b. Clown: This clown is holding balloon strings; put balloons on the strings.

EVALUATION

Given a #2 pencil and sheet of 8½ x 11 plain paper, when shown a stimulus card on which a shape is printed and requested to "draw this," the child is able to successfully execute each of the following shapes, beginning at the top:

a. Circle

b. Cross

RESOURCES

Circle Visual Card

Cross Visual Card

Worksheets Circle 4a and Circle 4b

Pencils, Chalk, Paper

Clear Templates

Source: Developmental Learning Materials
3505 North Ashland Avenue
Chicago, Illinois, 60657

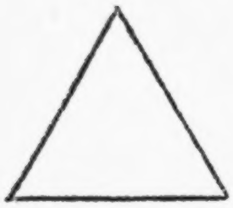
Clear stencils, cat. #M137
@ $5.50

BEHAVIORAL OBJECTIVES	STRATEGIES
4. Given a #2 pencil and sheet of 8½ x 11 paper and presented with a card on which is drawn a square and requested to "draw this," the child is able to draw the square beginning at the top and executing it with a single continuous line.	1. Templates: Give the child the "square" template. Allow him to trace along the inside edge with his index finger, encouraging him to begin at the top. Then allow him to use the template with chalk at the chalkboard. When he is able to trace the shape with ease, allow him to use a template on a flat desk surface, tracing the shape on paper. 2. Forming Squares with Children: Allow children to stand and form a square. Begin by asking how many corners the square has, then asking for volunteers to stand in corner positions. Then allow other children to stand in between to finish the square. Ask children to then "walk the square," encouraging and guiding them to make square corners. 3. Provide children with ample opportunities to draw free hand squares. 4. Give children worksheets presenting visual stimulus and requiring free hand drawing of squares at designated places: a. Block Tower: This is a block. Make a block tower. (Provide further explanation to those needing it.) 5. Ask the children to make a square. Discuss with them various objects and things which they recall as being "square." Then ask them to make anything they wish from their squares.

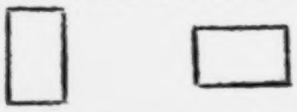
EVALUATION	RESOURCES
Same as objective.	Clear Stencils
	Chalk, Pencils, Paper
	Square Visual Card
	Worksheets

BEHAVIORAL OBJECTIVES	STRATEGIES
4. Continued	6. Square Dot-to-Dot Worksheets: Give the child a dot-to-dot worksheet. Ask him to follow the dots and complete the picture: a. Block b. Jack-in-the-Box c. Television Set
5. Given an exercise comprised of paths in varying widths from 1/8" to 3/4", the child is able to draw a single line from left to right without lifting his pencil and staying within the boundaries of the path.	1. Provide the child with experiences as programmed in the Dubnoff School Program/1, Level 2. 2. Provide the child with frequent worksheet exercises in drawing lines inside path boundaries. Paths should be 1½" in width at first, gradually decreasing to ¼" in width as skill is increased. Begin with paths which are straight and move to curved paths. Insist that lines be drawn from left to right, that papers be correctly positioned (especially important if the child is left-handed), and encourage the child not to lift his pencil.

EVALUATION	RESOURCES
Given an exercise of paths, the child is able to draw a line from left to right, staying within the confines of the path boundaries and without touching the sides or lifting his pencil, demonstrating success in 5 out of 6 (or whatever).	Teacher-made Exercises Frostig Exercises (Visual-Motor) Dubnoff School Program/1, Level 2 Teaching Resources Continental Press "Visual Readiness Skills Level 1," Pages 1, 2, 3 Teacher-prepared packets of materials

BEHAVIORAL OBJECTIVES	STRATEGIES
6. Given a simple drawing, the child can color it as requested, filling in between lines without coloring outside the boundaries.	1. Provide the child with coloring experiences using the Frostig materials and proceeding as directed in the Frostig manual. Upon completion, the child should be able to successfully color simple drawings. 2. Provide the child with experiences coloring simple drawings.
7. Given a #2 pencil and 8½ x 11 plain paper, presented with a card on which is drawn a triangle and requested to "draw this," the child is able to draw the triangle, beginning at the top and without rotating his paper, the finished product having two oblique lines defining the sides and a horizontal baseline. 	1. Templates: Give the child the triangle template. Allow him to trace along the inside edge with his index finger, encouraging him to begin at the top with an oblique movement down each side, followed by a horizontal movement at the baseline. Then allow him to use the template at the chalkboard with chalk. When able to trace the shape with ease, allow him to use the template on a flat desk surface, tracing the triangle on paper with a pencil. Allow him to use a continuous line if he prefers, but do not require the same and guide him initially in non-continuous line execution. 2. Forming Triangles with Children: Discuss the number of points on a triangle (and the number of sides). Allow three children to volunteer and position selves at points. Let others line up to form sides. Let them "walk out" the triangle. 3. Allow children frequent opportunities to draw free hand triangles.

EVALUATION	RESOURCES
Given a simple picture (specified), the child is able to color it, filling in within the line boundaries without evidence of going outside the lines.	Frostig Exercises 79 - 90
Same as objective.	Triangle shape clear template Chalk, Pencil, Paper Dot-to-Dot pictures Frostig VM Exercise 70

BEHAVIORAL OBJECTIVES	STRATEGIES
8. Given a #2 pencil and a sheet of unruled 8½ x 11 paper, presented with an outline drawing of a rectangle and asked to "draw this," the child is able to draw the rectangle beginning at the top and using a continuous line, the finished product having two sides decidedly longer (to distinguish it from the square).	1. Talk about the elongated rectangle and how it differs from the square (which the children have mastered). In presenting a visual stimulus, be certain the rectangle is presented in both its vertical and horizontal orientations:  Ask the children to identify objects and things which are "rectangles." 2. Frostig Worksheet (VM Exercise 71) Directions: "All the boxes on this page have four dots in them. In one of the boxes, the four dots have been joined to make a rectangle. See if you can make a rectangle in each box by joining the dots. Remember to begin with the top dot in each box." 3. Free Hand Drawing: Give the child opportunities to draw rectangles on unruled paper. He may want to "make something" out of his rectangle. 4. Dot-to-Dot Picture Completion: Present the child with Dot-to-Dot worksheet and ask him to connect the dots to finish the picture. a. Train b. House

EVALUATION	RESOURCES
Same as objective.	Worksheets: a. Frostig VM: Exercises 71 b. Dot-to-Dot Pictures

BEHAVIORAL OBJECTIVES	STRATEGIES
9. Given a simple drawing composed of various lines (circular, vertical, horizontal, oblique), the child is able to trace or outline the drawing with a crayon.	1. Provide the child with drawings of various shapes (described in the objective) and ask the child to trace the lines with crayon. As skill is demonstrated, increase the difficulty of the task by asking the child to use a #2 lead pencil. The Continental Press worksheets #4 may be used. Ask the child to trace along lines with his pencil or crayon, trying not to lift his tool, and he moves from left to right to the end. With #5 and #6 dittoes, the child must start at a stimulus and follow over the path to a directed point (i.e., "Take the boy to school." etc.).
	2. Give the child simple drawings to trace or outline. Encourage him not to use back and forth (scribbling) movements in his tracing.

EVALUATION	RESOURCES
Given a drawing (specified), the child is able to outline, covering lines of the drawing without evidence of losing control and going beyond drawing lines (white space showing between outlining and line of drawing) or scribbling (back and forth motions).	Drawings of geometric shapes Simple line drawings (as in simple coloring books) Frostig Exercises (Visual Motor) Crayons Pencils Dubnoff School Program/1, Level 1 by Teaching Resources Continental Press Worksheets #4, 5, 6; Visual Readiness Skills, Level 1

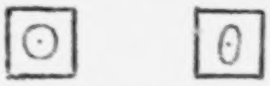
Skill: Geometric Inserts

BEHAVIORAL OBJECTIVES

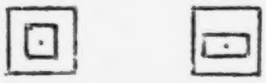
1. Given the five Geometric Insert sets with all the geometric forms removed, the child is able to replace all the forms into their proper position in the trays.

STRATEGIES

1. Give the child the Geometric Inset tray with the circle and oval form insets. Demonstrate the removal and replacement of the forms. Let the child remove and replace them. Then remove them for the child. Hand him one of the forms and request that he replace it (now he must visually or by method of trial and error choose which of the two insets it will fit into.)

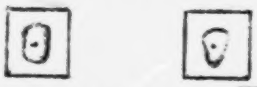


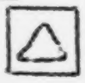
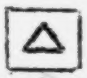
2. Present the squares and rectangle sets. Procede in the same manner as above. Discuss differences discovered between squares and rectangles.



3. Reintroduce the circle and oval and give the child an opportunity to choose from four in replacing a form given him.

4. Give the child the oval and egg shape forms. Briefly discuss those differences the child has noted in visual appearance of the two. Follow the procedure above for guiding the child in his ability to replace forms.



5. Give the child the  and the  . Allow the child to report on his discovery of their differences in appearance. Instruct him to remove and replace the forms in their appropriate insets.

EVALUATION

Preparation for Task Evaluation:

Set out on tables all five Geometric Inset trays and remove the Geometric Form inserts.

Evaluation:

When requested to replace the geometric forms into the inset trays, the child will successfully accomplish the task within five minutes.

RESOURCES

Geometric Insets Set (4004) @ $19.50

Educational Media, Inc.
P.O. Box 39
Ellensburg, Washington 98926

Tupperware Balls

Lacing Boot & Block shape inserts

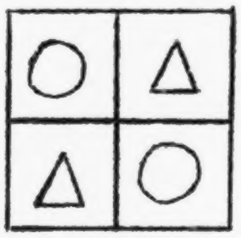
BEHAVIORAL OBJECTIVES	STRATEGIES
1. Continued	6. Introduce the remainder of the forms in a similar manner. 7. Independent Activity: Allow the pupil frequent opportunities to work with the Geometric Inset sets and the Tupperware balls.
2. Given ten geometric form inserts and ten corresponding form cards, as the teacher presents each of the geometric form inserts (one at a time), the child is able to accurately locate the corresponding form card and will successfully place the form insert over the picture in a manner that none of the picture form background is showing from behind the insert.	1. Present the child with the basic shapes of circle, square, triangle, and rectangle (insert forms) and the corresponding form cards. Choose one of the form inserts and direct the child to find the picture card of the form. When this is accomplished, hand the form to the child and direct: "Put this over the picture on the card. Try to cover the pictured (circle, square, etc.)" Provide the child with a demonstration, if needed (Avoid too much verbal direction as this often serves only to confuse the child.) 2. Present more complex forms in the same manner, a few at a time. As skill is acquired, give the child forms which requite closer visual discrimination. 3. Independent Activity: Make materials available to pupils for their independent study.

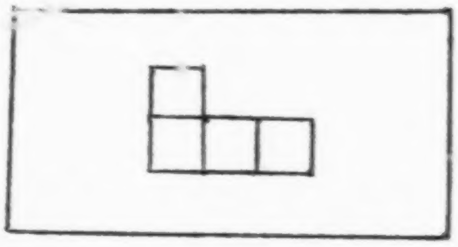
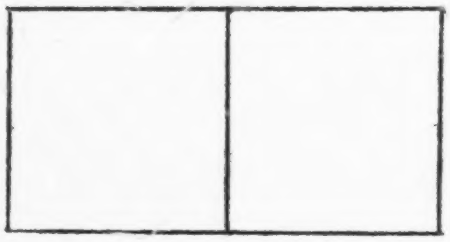
EVALUATION	RESOURCES
Same as objective.	Teacher prepared shape drawings (8½" x 11" heavy tag with colored shapes drawn on them.)

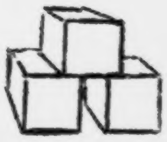
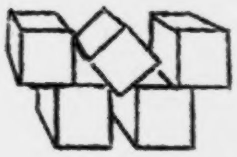
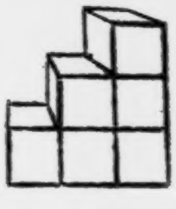
Skill: Stacking and Aligning Blocks

BEHAVIORAL OBJECTIVES	STRATEGIES
1. Given 1" cubes, the child is able to stack them to build a tower as requested: a. Build a tower with 2 cubes. b. " " " " 3 " c. " " " " 4 " d. " " " " 5 " e. " " " " 6 " f. " " " " 7 " g. " " " " 8 " h. " " " " 9 " i. " " " " 10 "	1. With two 1" cubes, demonstrate the building of a tower. Ask the child to build a 2-cube tower. 2. Continue, allowing the child to build his tower higher, as skill is attained, until he can successfully build a 10-cube tower. 3. Visual Memory Game: Give the child ten cubes. Behind a cardboard screen, build a tower of a specific size (one to ten cubes in height), remove the screen, and allow the child to study the example for two seconds. Knock down the structure and ask the child to make one like the one he studied.
2. Given a stack of dominoes, the child is able to stack them, placing them parallel, to build a tower of ten.	1. Demonstrate the procedure of building a tower with dominoes, making certain the dominoes are laid in the same direction (parallel) in stacking. 2. Independent Activities: Provide the pupil with ample opportunities to build towers with dominoes.

EVALUATION	RESOURCES
On request, the child will be able to build a non-toppling tower by stacking 1" cubes of varying heights. a. Build a 2 cube tower. b. " " 3 " " c. " " 4 " " d. " " 5 " " e. " " 6 " " f. " " 7 " " g. " " 8 " " h. " " 9 " " i. " " 10 " "	1" Cubes a. Colored, #WE110 @ $4.00/box b. Plain, #WE117 @ $1.75/box Developmental Learning Materials 3505 North Ashland Avenue Chicago, Illinois 60657
On request, the child will be able to build a tower of ten dominoes, laying all dominoes parallel.	Shape Dominoes, #DE612 @ $1.50 or Pre-School Dominoes, #DE611 @ $3.50 Creative Playthings, Inc. Educational Department Princeton, New Jersey

BEHAVIORAL OBJECTIVES	STRATEGIES
3. Given four 1" cubes, the child is able to align and build a train after seeing a model.	1. Demonstrate the building of a train and guide the child in his attempts to copy it as demonstrated. 2. Visual Memory Game: Prepare a model behind a cardboard screen. Remove the screen and allow the child to study the model for two seconds. Knock down the model and ask the child to make one like the one he saw. 3. Present the child with the Block Train Card and ask him to read the card and make a train of cubes like the one pictured.
4. Given two dominoes, the child is able to align the two dividing lines on the dominoes as demonstrated. 	1. Take two dominoes and point out the lines of division on the blocks. Show the child how to match the lines. Ask the child to match the lines of the two dominoes you've given him. 2. Allow the child to select a group of dominoes and line them up, matching dividing lines.
5. Given a domino and a 5 x 8 card, with a single vertical line, the child is able to align one end of the domino with that line on the paper as demonstrated.	Demonstrate the procedure of placing the end of the domino on the line drawn on a card. Provide the pupil with ample opportunities to practice.

EVALUATION	RESOURCES
Given four 1" cubes and a Block Train Card with cubes, the child is successful in aligning and building the train as pictured.	1" Cubes Card with train drawn on it, i.e. 
Given two dominoes, the child is able to accurately align them when asked to "match the dividing lines."	Shape Dominoes (see #2)
Given a domino and divided 5 x 8 card, the child is able to align one end of the domino with the line on the card when requested to "place the domino on the card and place the end of the domino on the line of the card."	5 x 8 card having vertical line down the center: 

BEHAVIORAL OBJECTIVES	STRATEGIES
6. Given ten 1" cubes, the child is able to use three of them, as needed, to build a bridge like the one demonstrated. 	1. Demonstrate how the bridge is built with three cubes. Allow the pupil to practice and guide him in his learning as needed. 2. Visual Memory Game: Build a "bridge" behind a cardboard screen. Remove the screen, allow two seconds of pupil study, knock down the structure, and ask the pupil to "make one." Vary the game by alternately building the train and the bridge, allowing the child to view, then asking him to make one.
7. Given ten 1" cubes, the child is able to use five of them to build a gate like the one demonstrated. 	1. Demonstrate the building of the gate using five 1" cubes. Allow the child to build a gate like the model. (You may need to help him with the center block.) 2. Play the Memory Game: Behind a screen build either the bridge, train, or gate. Allow the child to study the model for two seconds. Knock it down and allow him to make one like the one he saw.
8. Given ten 1" cubes, the child can use six of them to build steps after viewing a demonstration model. 	Demonstrate the manner in which steps are built, beginning with the one block on the left, stacking two blocks to the right, etc. Allow the child to copy the model.

EVALUATION	RESOURCES
Given ten 1" cubes, the child can successfully build a bridge after a task demonstration	1" Cubes
Given ten 1" cubes, the child will select five and successfully build a gate after demonstration.	1" Cubes
Given ten 1" cubes, the child will select six and successfully build steps after demonstration.	1" Cubes

BEHAVIORAL OBJECTIVES	STRATEGIES
9. Given ten 1" cubes, the child can use all of them to build steps after seeing a demonstration model.	1. Demonstrate the manner in which the steps are made using all ten blocks. Again, emphasize the importance of beginning with the first step, stacking two next to it, working from left to right. 2. Memory Game: Behind a cardboard screen, build either a six or ten cube model. Allow the child to view the model for two seconds. Knock it down and ask the child to build one like the model.
10. Given a series of six picture cards showing the 10-cube tower, train, bridge, gate, and two steps, the child is able to read each card and build the model with 1" cubes.	1. Show the child the picture card picturing the tower. Ask him to read the card and build one like it from his cubes. Continue with other picture cards. 2. If the child makes an error, ask him to read the card again and see if he can tell how his structure differs.

EVALUATION	RESOURCES
Given ten 1" cubes, the child can use them all to build steps after seeing a demonstration model.	1" Cubes
Given ten 1" cubes and each of the six picture cards, the child is able to successfully read and build any four of the six structures represented, when asked to "read the card and build it."	Picture cards 1" Cubes

APPENDIX B

DEVELOPMENTAL LEARNING MATERIALS AND PROGRAMS

CLEAR STENCILS

(Developmental Learning Materials No. M137)

Components: Five clear plastic stencils: straight line, circle, triangle, square, diamond.

Adaptations: Black ink arrow placed at starting point, indicating direction.

Objectives:

1. Given any one of the five stencils, child will identify it by name correctly.
2. Given any one of the five stencils, child will describe a minimum of two distinguishing characteristics.
3. Given any two stencils, child will tell how they are alike and how they are different.
4. Given any one of the five stencils, child will trace on paper following line from top to bottom and from left to right in a continuous line.
5. Given any one of the five stencils, child will relate it to some object in the real world which is the same shape or contains elements of the same shape.
6. Given one or more of the five stencils in a variety of orientations, child will identify each shape correctly by name.

Other Uses: Given a choice of five stencils, child will select from two or more of them to make an original design.

INCH CUBE DESIGNS

(Developmental Learning Materials No. W110 and P111)

Components: Ninety-six one-inch cubes in six primary colors and 34 design cards consisting of a Vertical Stacking Series (Cards 1 - 28) and a Horizontal Placement Series (Cards 1 - 34).

Adaptations: None.

Objectives:

1. Given a set of one-inch cubes and a design card, child will demonstrate recognition of relationship between actual object and its representation by constructing design correctly.

2. Given a set of one-inch cubes and a design card, child will demonstrate task organization by (a) selecting a starting point or points on the design, (b) keeping place on the design and the construction, and (c) maintaining an orderly progression to completion of task.

3. Given a set of one-inch cubes and a design card, child will demonstrate perception of spatial relationships, one block to another and several blocks to each other, by constructing design correctly.

4. Given a set of one-inch cubes and a design card, child will demonstrate ability to mentally "hold" a foreground figure apart from background of many blocks by constructing designs correctly.

Other Uses:

1. Visual memory: Teacher or other child constructs design out of sight of child. Child studies design 8 to 10 seconds. One or more blocks are removed and child is to look, then tell color of block removed.

2. Child studies design for 10 seconds and uses visual recall to construct design without card.

Child will develop fine muscle control in handling blocks and putting them in place without disturbing the existing design. Eye coordination and control are exercised in comparing design card with construction and in placing blocks accurately.

The Vertical Stacking Series (Cards 1 - 28) is used by placing a card upright in the holder and having the child build vertically. The Horizontal Placement Series (Cards 1 - 34) is more difficult and is used after the Vertical Series is mastered. In this series, it is necessary to organize and relate sides, top, and bottom on pattern to corresponding locations on the construction.

In all cases, children begin at a level at which they can succeed and yet be challenged. Subjects move through a series as quickly as they are able.

LARGE PARQUETRY DESIGNS

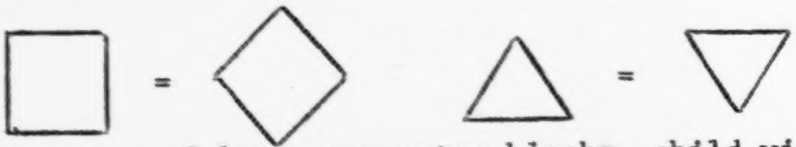
(Developmental Learning Materials No. W113 and P114)

Components: Thirty-two large parquetry blocks consisting of squares, diamonds, and isosceles triangles in six colors to be used with a set of 22 design cards.

Adaptations: None.

Objectives:

1. Given a design card and a set of blocks, child will demonstrate awareness of relationship between reality and its representation by selecting the correct blocks for the design.
2. Given a design card and a set of blocks, child will demonstrate ability to organize a task by (a) selecting a starting point or points on the design, (b) keeping place on the design and the construction, and (c) maintaining an orderly progression to completion of task.
3. Given a design card and a set of blocks, child will demonstrate perception of spatial relationships by (a) fitting one block correctly by another and (b) fitting several together for a pattern.
4. Given a set of large parquetry blocks, child will identify correctly each form in different orientations:



5. Given a set of large parquetry blocks, child will identify the same form despite varying color, thus perceiving that form remains the same despite color.
6. Given a set of large parquetry blocks and design cards, child will demonstrate ability to perceive discriminatingly at one time several characteristics (color, shape, orientation in space) of a stimulus object by executing designs correctly without adult assistance.

Other Uses:

1. Matching all of the like forms to each other.
2. Playing a game of identifying the forms with eyes closed, from tactual and kinesthetic clues alone.
3. Placing the forms over separate outlines drawn on cardboard.
4. Creating structures or patterns by combining forms, i.e., two triangles forming a square, four squares

together forming a line or arranged to form a larger square, etc.

5. Making original designs.

6. Tracing designs on paper and coloring them.

Children will get practice in color and form matching, tactual and kinesthetic experience with several forms, small muscle exercise in handling forms, eye exercise and control by comparing design card and construction, and fine motor control by placing blocks so as not to disturb existing pattern.

SMALL PARQUETRY DESIGNS I

(Developmental Learning Materials No. P116)

Components: 1. Box of small parquetry blocks consisting of squares, triangles, diamonds, and half-diamonds in six different colors.

2. Twenty sequenced design cards.

Adaptations: Trial testing showed that in the case of seven cards, additional steps were needed in order for some of the subjects to arrive at a given design. Additional cards to provide these steps were locally produced for a total of 32 cards in the component.

Objectives:

1. Given a design card and a set of parquetry blocks, child will demonstrate an awareness of relationship between an actual physical reality and its representation by first making the design on the card, if necessary, and then making it correctly off the card.

2. Given a design card and a set of parquetry blocks, child will demonstrate ability to organize a task by (a) selecting a starting point, (b) keeping one's place, (c) maintaining an orderly procedure to complete task.

3. Given a design card and a set of parquetry blocks, child will demonstrate the ability to mentally hold a foreground figure (one block) apart from the background of many blocks by constructing the design correctly.

Other Uses:

1. Given a choice of colors, child will make the same design with variation in color.

2. Given one or more boxes of parquetry blocks, child will create own designs on flat top or by tracing around blocks on paper.

In addition to permitting the child to perform the above operations, the design patterns are intended to help the child (1) learn form identity regardless of orientation, (2) perceive discriminatingly characteristics of color, shape, and orientation in space, (3) perceive relationship of adjoining forms, and (4) perceive analytic-synthetic relationships of geometric wholes and parts, such as a large diamond made up of four diamonds, a large square made up of two or four triangles, etc.

Small finger muscles are exercised in picking up blocks and in placing them so as not to disturb the existing pattern. Controlled eye movements are practiced in observation and checking between design card and construction with blocks.

SMALL PARQUETRY DESIGNS II

(Developmental Learning Materials No. P179)

Components: Twenty designs of increasing difficulty to be constructed with small parquetry blocks.

Adaptations: None.

Objectives:

1. Given small parquetry blocks and design cards, child will demonstrate ability to perceive a whole as being composed of several parts by constructing designs correctly.

2. Given a design card, child will demonstrate ability to visualize how space can be divided to accommodate certain shapes by showing with hands and with oral explanations a logical means of division.

3. Given small parquetry blocks and design cards, child will demonstrate ability to flexibly change figure-ground relationships as parts are completed by correctly completing a partially constructed design.

The child will continue to get practice in the perceptual, tactual, kinesthetic, and visual-motor activities specified for Small Parquetry Designs I.

CLASS RECORD

Small Parquetry Designs II

Name	Card Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

SMALL PARQUETRY DESIGNS III

(Developmental Learning Materials No. P180)

Components: Twenty sequenced design cards showing outer shape of a particular design. To be used with small parquetry blocks.

Adaptations: None.

Objectives: 1. Given a design card with no color or shape cues, child will demonstrate ability to abstract by telling or showing what shapes will fit the space.

2. Given a design card with no color or shape cues, child will demonstrate adequate perception of spatial relationships by correctly constructing a design the same shape as on the card.

Students will work in stages. First, they will fit shapes on the design card, either partially or entirely. Next, they will be encouraged to construct as much of the design as possible off the card. Mastery is reached when design can be constructed entirely off the card and without assistance.

DESIGNS IN PERSPECTIVE

(Developmental Learning Materials No. P112)

Components: Twenty-four design cards in six colors to be used with colored inch cubes.

Adaptations: None.

Objectives:

1. Given one-inch colored cubes and a design card, child will demonstrate awareness of how view of surfaces of an object changes according to child's position in relation to the object by constructing design correctly.

2. Given one-inch colored cubes and a design card, child will demonstrate recognition that (a) one or two surfaces may be visible and that (b) three is the maximum number of surfaces that can be seen at one time, by constructing design correctly.

3. Given one-inch colored cubes and a design card, child will demonstrate recognition of how three dimensionality is represented on a flat surface by constructing design correctly.

4. Given one-inch colored cubes and a design card, child who experiences "figure-ground instability" or "reversible perspective" will demonstrate ability to regain foreground by constructing design correctly.

APPENDIX C

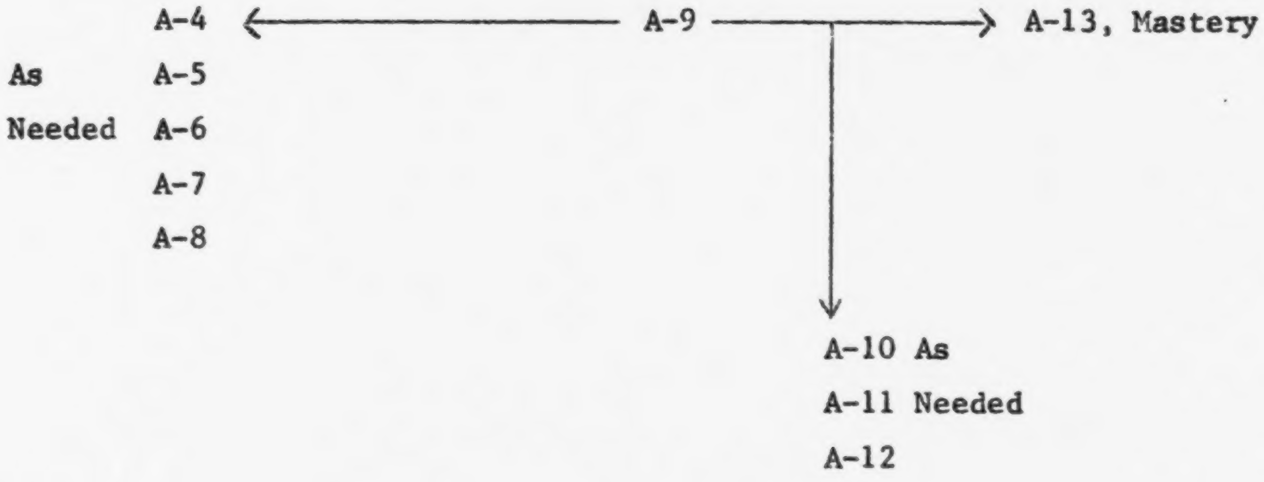
THE DUBNOFF SCHOOL PROGRAM, LEVEL 1

SECTION A - STRAIGHT LINE CONCEPT

Horizontal Lines (A-1 - A-13A)

Orientation Exercises: A-1, A-2, A-3

Entry Level



1. Everyone do A-1, A-2, A-3 for practice.

2. Success Criteria for Entry Level, A-9:

    a. Executes stroke from left to right.

    b. Demonstrates ability to make controlled line by stopping and starting at circles.

    c. Follows dotted lines and makes own line without gross deviations.

    d. Executes lines in one stroke.

    e. Strokes are made fluently, not painstakingly.

    f. Executes 4 out of 6 without gross deviations.

3. Criteria for Mastery, A-13: Same as above.

NOTE: A-13A is recommended as an enrichment and reinforcement activity. See manual for directions.

Vertical Lines (A-14 - A-22)

Orientation Exercises: A-14, A-15

Entry Level

A-16 ←——— A-19, top exercise only ———→ A-22, Mastery
A-17
A-18
A-19, bottom

1. Everyone do A-14 and A-15 for practice.

2. Success Criteria for Entry Level, A-19, top exercise:

   a. Executes lines from top to bottom.

   b. Demonstrates ability to make controlled lines by beginning and stopping at indicated points.

   c. Executes lines in one stroke.

   d. Strokes are made fluently, not painstakingly.

   e. Follows dotted lines without gross deviations.

   f. Executes 10 out of 12 lines without gross deviations.

3. Criteria for Mastery, A-22

   a. Same as a - d above.

   b. Follows dotted lines and mades own line without gross deviations.

   c. Executes 7 out of 9 without gross deviations.

NOTE: A-16 is recommended as an enrichment and reinforcement project as well as for additional practice. See manual for directions.

Combination Vertical-Horizontal (23-25)
and Square (26-32)

Orientation Exercises: A-24, A-25

Entry Level

New ← A-30 → A-31

A-26 A-32, Mastery

A-28

A-29

1. OMIT A-23 and A-27. Everyone do A-24 and A-25 for practice.

2. Before using A-30 for entry level, demonstrate procedure for making a square. Stress beginning at upper left, then down, over, up, and back in a continuous line.

3. Success Criteria for Entry Level, A-30:

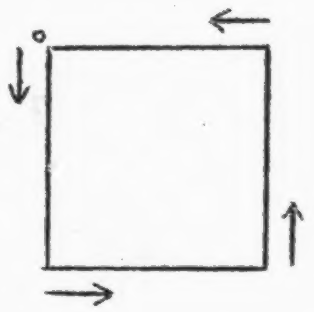
   a. Starts at upper left.

   b. Goes down, over, up, and back in continuous line.

   c. Makes square corners.

   d. Writes fluently, not painstakingly.

   e. Meets above criteria in 3 out of 4 squares.



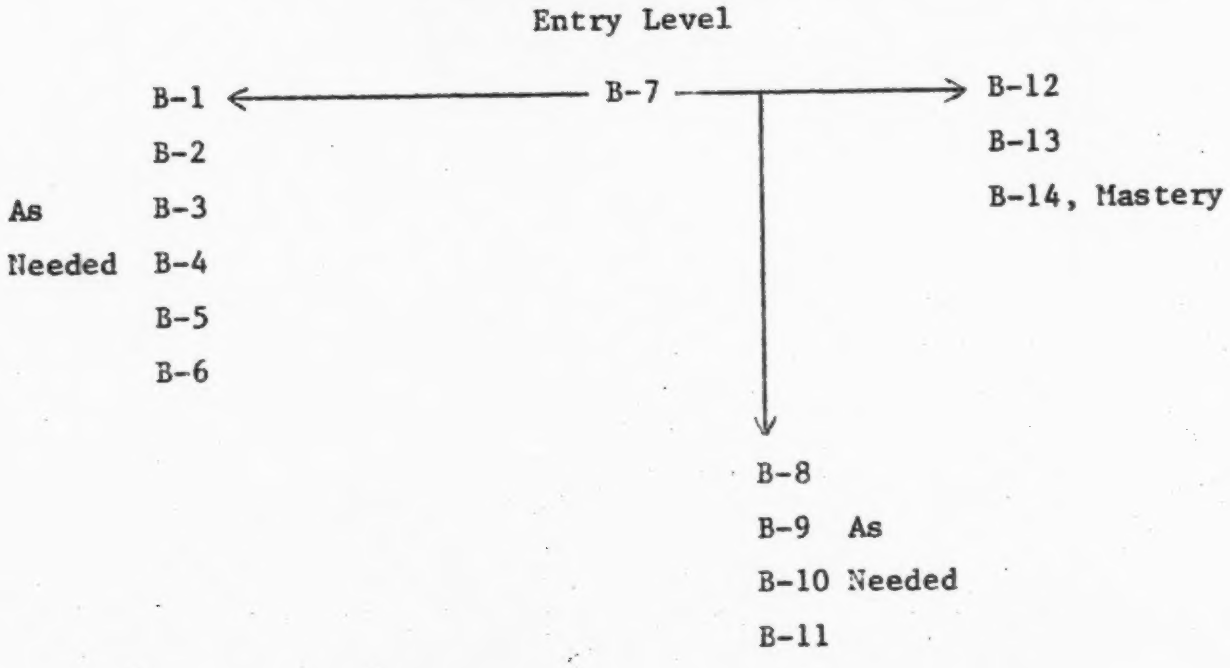
4. If more practice is needed, use A-26, A-28, A-29 of the new series, as needed. A pupil does not necessarily need all of them.

5. If A-30 is OK, go on to A-31 and A-32.

NOTE: Exercises B-16 through B-21 deal with spheres. Use them only if you have children who don't understand concept of roundness. Sheets can be used for practice or in any way you like. Check off on your record if you use any of them with children but don't plan to program everyone through them.

SECTION B - CIRCLES

Orientation Exercises: B-1, B-2



1. Everyone do B-1 and B-2 for orientation to circles.

2. Success Criteria for Entry Level, B-7:

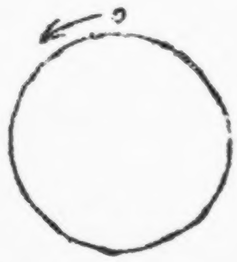
    a. Starts at top.

    b. Goes counterclockwise.

    c. Uses firm line.

    d. Uses fluent, not "drawing" stroke.

    e. Makes 6 out of 7 circles without gross line deviations.



3. If B-7 is too demanding, have pupil go back to any one or more of B-1 through B-6. If you want more practice on B-1 and B-2, use original sheet from Dubnoff box and acetate boards.

4. If B-7 is quite good, but more practice is indicated, do B-8, B-9, B-10, B-11 as needed.

NOTE: START CIRCLES AT TOP OR SLIGHTLY TO RIGHT OF TOP. ALWAYS GO IN COUNTERCLOCKWISE DIRECTION. ALL SHEETS IN THIS SECTION WILL HAVE TO BE TURNED SO ARROWS START CIRCLES JUST TO RIGHT OF TOP.

If you have pupils who need to practice and motivation of pasting circles on exercise 6 or 8, I have the sheets with circles. I suggest just doing the pasting on 1 of the exercises and use other for regular practice.

For 9, 10, 11, just have children outline unless there is a good reason for going into the business of finding centers, etc. You might use the reinforcements for 9 as a "good work activity." Only children with trouble understanding concept of roundness need to do activities suggested in guide for these sheets.

SECTION C - DIAGONAL LINE CONCEPT

Directionality

I. C-1 through C-7, Left-Right Oblique

Orientation Exercises: C-1, C-4

Entry Level

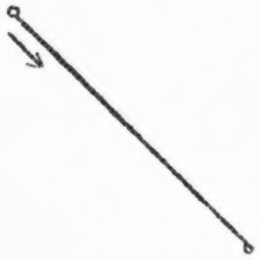
C-2 ←———————— C-4 ————————→ C-7, Mastery

As C-3

Needed C-4

C-5

1. Success Criteria for Entry Level, C-6:
    a. Continuous line.
    b. Fluent line, not painstakingly drawn.
    c. Line begins at top, extends to lower dot, and stops.
    d. Executes 5 out of 6 strokes without gross deviations.



2. Criteria for Mastery, C-7:
    a. Same as a - c above.
    b. Executes 2 out of 3 without gross deviations.

II. C-8 through C-14, Right-Left Oblique

Orientation Exercises: C-8, C-11

Entry Level

C-9 ←———————— C-13 ————————→ C-14, Mastery

C-10

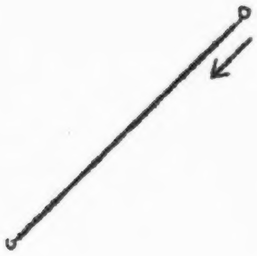
C-11

C-12

1. Success Criteria for Entry Level, C-13: Same as above.

2. Criteria for Mastery, C-7:

    a. Same as a - c above.
    b. Executes 6 out of 8 without gross deviations.



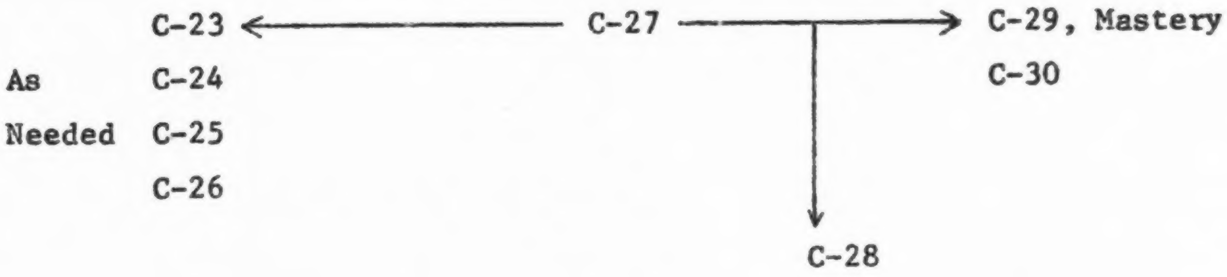
NOTE: Omit C-15 through C-20.

Construction of a Triangle

C-21 - C-30

Orientation Exercises: C-21, C-22

Entry Level



1. Success Criteria for Entry Level, C-34:

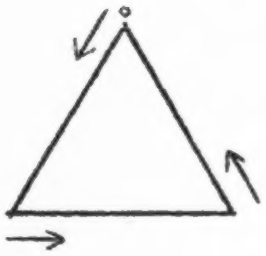
   a. Begins at top.

   b. Goes counterclockwise.

   c. Uses continuous line.

   d. Uses fluent line.

   e. Executes both triangles without gross deviations.



2. Criteria for Mastery, C-30:

   a. Begins at top.

   b. Goes counterclockwise.

   c. Uses continuous line.

   d. Uses fluent line.

   e. Angles are sharp, not curved.

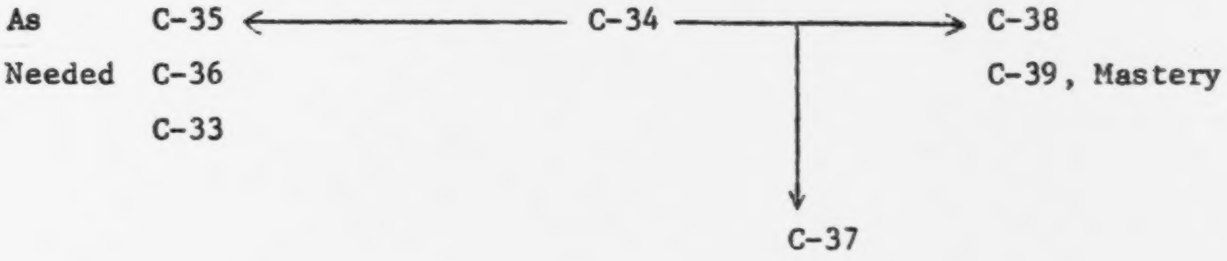
   f. Executes 6 out of 7 of the broken-lined triangles without gross deviations.

Construction of a Diamond

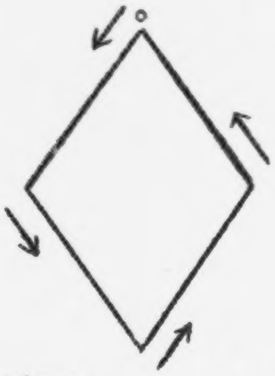
Vertical Diamond C-31 - C-32

Orientation Exercises: C-31, C-32

Entry Level



1. Success Criteria for Entry Level, C-34:



   a. Begins at top.
   b. Goes counterclockwise.
   c. Uses continuous line.
   d. Uses fluent, not painstaking, stroke.
   e. Makes sharp angles at all 4 points.
   f. Makes 3 out of 4 diamonds without gross deviations.

2. Criteria for Mastery, C-39:

   a. Begins at top.
   b. Goes counterclockwise.
   c. Uses continuous line.
   d. Uses fluent lines.
   e. Makes sharp angles at all 4 points in diamond.
   f. Makes both diamonds without gross deviations.

NOTE: C-33 SHOULD BE USED LAST IN THE SPECIAL PRACTICE CATEGORY.

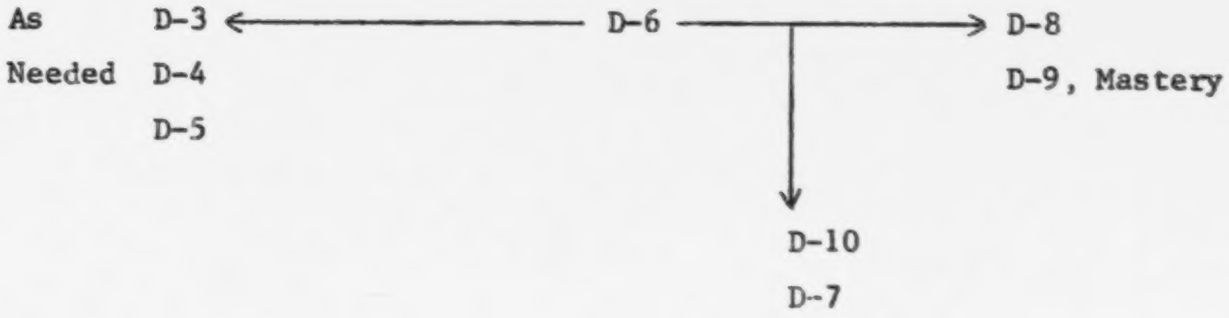
SECTION D - INTERSECTING LINE CONCEPT

Straight Line Cross

D-1 through D-10

Orientation Exercises: D-1, D-2

Entry Level



1. Success Criteria for Entry Level, D-6:

   a. Begins with vertical line, goes from top to bottom.

   b. Horizontal line goes from left to right.

   c. Lines are approximately straight.

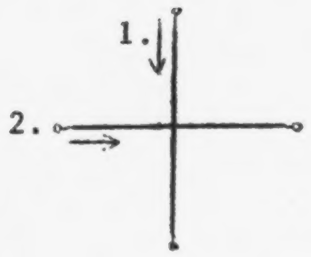
   d. Lines begin and end at designated points (circles).

   e. Vertical and horizontal lines intersect approximately at center.

   f. Each line (vertical and horizontal) is executed in a continuous stroke.

   g. Lines are made fluently.

   h. Both straight line crosses are executed without gross deviations.



2. Criteria for Mastery, D-9:

   Same as a - h above, except 5 out of 6 crosses are executed without gross deviations.

NOTE: a. D-11 has been omitted from this program.

b. D-10 has been placed out of its chronological order.

Dubnoff Program, Level 1

NAME________________________________

SECTION A - Straight Line Concept

Horizontal Lines 1-13	
Vertical Lines 14-22	
Combination Vert-Hor 23-25	
Square 26-32	

SECTION B - Circular Concept

Tracing 1-15	
Spheres 16-21	

SECTION C - Diagonal Line Concept

Directionality 1-20	
Triangle 21-30	
Diamond 31-39	

SECTION D - Intersecting Lines Concept

Straight Line Cross 1-11	
Diagonal Line Cross 12-18	

HORIZONTAL LINE EXERCISE

Tasks	Rating					
	1	2	3	4	5	Comments
I. Air Writing						
A. Performs with dominant hand						
B. Sweeps easily from left to right						
II. Board Writing						
A. Writes from left to right						
B. Writes from top to bottom						
C. Executes lines fluently						
III. Paper Exercise						
A. Matches circles by color						
B. Matches shape and size						
C. Measures strips to line size accurately						
D. Cuts strips easily						
E. Pastes shapes and strips in places indicated						
IV. Work Habits						
A. Works systematically and methodically						

Tasks	Rating					
	1	2	3	4	5	Comments
B. Completes task in reasonable time						
C. Works independently						
D. Shows satisfaction in working to best of ability						

Dubnoff Program, Level 1

SECTION A - STRAIGHT LINE CONCEPT

Name	Horizontal Lines													Vertical Lines									Combin. Vert-Hor			Square						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

SECTION B - CIRCULAR CONCEPT

Name	Simple Tracing of Circles															Introduction to Spheres					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

SECTION C - DIAGONAL LINE CONCEPT

Name	Directionality															Construction of a Triangle										Construction of a Diamond								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Omit 15-20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39

SECTION D - INTERSECTING LINES CONCEPT

Name	Straight Line Cross											Diagonal Cross					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

APPENDIX D

MISCELLANEOUS

MINICOURSE SCHEDULE
Organizing the Kindergarten for Independent and Small Group Work

DATE	SUBJECT	TIME	TECHNICIAN	EQUIPMENT
Monday September 21	Microteach	9:00 a.m. - Bobb 10:15 a.m. - Martin 1:15 p.m. - Poor	Pugsley - set up Northrop	VTR & Camera (WSU)
Tuesday September 22	Microteach	9:00 a.m. - Mueller 10:15 a.m. - Slack	9:00- 9:30 Northrop 9:30-11:15 Pugsley	VTR & Camera (WSU)
Friday September 25	Instructional Sequence II, Model Lesson II	11:30-12:30	Kelly	VTR (Pullman)
Monday September 28	Microteach	9:00 a.m. - Bobb 10:15 a.m. - Martin 1:15 p.m. - Poor	Northrop or Bell	VTR & Camera (WSU)
Tuesday September 29	Microteach	9:00 a.m. - Mueller 10:15 a.m. - Slack	Northrop or Bell	VTR & Camera (WSU)
Friday October 2	Instructional Sequence III Model Lesson III	11:30-12:30	Kelly	VTR (Pullman)

DATE	SUBJECT	TIME	TECHNICIAN	EQUIPMENT
Monday October 5	Microteach	9:00 a.m. - Bobb 10:15 a.m. - Martin 1:15 p.m. - Poor	Northrop or Bell	VTR & Camera (WSU)
Tuesday October 6	Microteach	9:00 a.m. - Mueller 10:15 a.m. - Slack	Northrop or Bell	VTR & Camera (WSU)
Friday October 9	Instructional Sequence IV Model Lesson IV	11:30-12:30	Kelly	VTF (Pullman)
Monday October 12	Microteach	9:00 a.m. - Bobb 10:15 a.m. - Martin 1:15 p.m. - Poor	Northrop or Bell	VTR & Camera (Pullman)
Tuesday October 13	Microteach	9:00 a.m. - Mueller 10:15 a.m. - Slack	Northrop or Bell	VTR & Camera (Pullman)

QUESTIONNAIRE

Minicourse 8

Organizing the Kindergarten for Individual and Small Group Instruction

1. As a participant in Minicourse 8, how would you rate this course as compared to other types of inservice experiences?

____Much Better Than	____Better Than	____On Par With	____Worse Than	____Much Worse Than

2. Overall, what was your opinion of:

A. The course content?

____Liked Very Much	____Liked	____Neutral	____Disliked	____Disliked Very Much

B. The method of presentation?

____Liked Very Much	____Liked	____Neutral	____Disliked	____Disliked Very Much

3. What problems or difficulties did you have in connection with the course? Please be as specific as possible.

4. What changes would you suggest in:

A. Course Content:

B. Method of Presentation?

Tape Scripts

Visual-Motor Program: Instructional Tape for Making Geometric Shapes
To be used with slides VMG 1-13

Today you are going to make some shapes. First, be sure you have at least two sheets of plain paper to write on and a pencil. The slide carousel should be turned on--remember the button on the carousel must be pushed way to the top so the light goes on. You should see the shape of a circle on the wall or screen. If you do not see it, push the forward button on the control until it shows.

Don't make the circle yet. Wait until I tell you to make it.

Look at the green dot at the top of the circle. This is the place to start when you make the circle. Notice the direction the arrow goes. Now make a circle on your paper starting at the top and going the same way the arrow goes. Don't turn the paper. Write smoothly and without lifting your pencil from the paper. O.K. Go ahead.

Does your circle look like the one on the screen?

Press the forward button to the next shape. This is called a straight line cross. Wait to make it until I tell you. Notice the green dot with a number one by it. This is the first line to make. Start at the top and go straight down without lifting your pencil or turning your paper. O.K. Make that line. Now, look at the green dot with the two by it. Start there and go from left to right to make a line going across. O.K. Go ahead and make that line. Now push the forward button for the next slide. Here is the way your straight line cross should look.

Are your lines straight? Is the up and down line about as long as the line going across?

Now press the forward button to the next shape. I'm sure you know that shape is a square. Wait until I tell you to make it on your paper. Look at the green dot and see the arrow pointing down. This is where you start. You should go down, over, up, and back without raising your pencil from the paper. Make your lines as straight and smooth as you can and your corners square. Don't turn your paper. O.K. Go ahead and make your square on the paper.

Press the forward button to the next shape. This is a triangle. Notice the green dot with the arrow pointing down. When you make the triangle, start at the top where the green dot is, go down, and all the way around without lifting your pencil or turning your paper. Try to make the points nice and sharp. O.K. Make the triangle on your paper.

This is a shape that we call a spider web. Do you see why? Don't begin to make it yet. There will be a different slide to show you how to make each line. Push the forward button to the next shape that shows how to start a spider web shape. This is called a rectangle. Look at the green dot and the arrow pointing down. Make the rectangle by starting at the top and going down, across, up, and back without raising your pencil or turning your paper. O.K. Make the rectangle on your paper. Now press the forward button. Make the straight up and down line starting where the green dot is. Press the forward button again. Make the line going across on your rectangle starting where the green dot is. Make it without lifting your pencil.

Press the forward button. Here is the same rectangle with the line going from one corner to the other. This is called a diagonal line. When you make this line on your spider web, start where the green dot is. Now make the diagonal line.

Press the forward button. Look where the green dot is. This tells you where to start the other diagonal line. Now make that diagonal line on your spider web by starting where the green dot is. Your spider web is finished. Now try making another spider web all by yourself and see if you can remember how to make all the lines.

When you have finished your spider web, press the forward button to the next shape. This is called a horizontal diamond. That means it goes across instead of up and down. Look where the green dot is, and look where the arrow points. When you make your diamond, you start where the dot is and go the same direction as the arrow points. O.K. Make the diamond without raising your pencil from the paper and without turning your paper. Make the corners nice and sharp.

Now press the forward button to a new shape. This is the last one. It is a vertical diamond. That means it goes up and down instead of across. Look where the green dot is and look where the arrow points. When you make this diamond, you start where the dot is and go the same direction as the arrow points. Don't turn your paper. O.K. Make this diamond without raising your pencil from the paper and without turning your paper. Make corners nice and sharp.

You've done a lot of work today making all these shapes, and now you are finished. Press the button on the projector that turns off the carousel. Now, on the cassette, press the button that reverses the tape so it is all ready for the next person.

Visual-Motor Program: Instructional Tape for Making Geometric Shapes
To be used with slides VMG 14-20

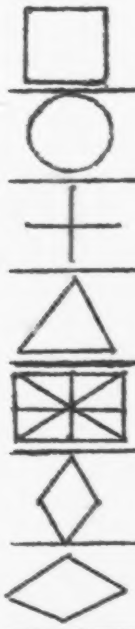
You've learned to make a lot of shapes. Now let's see if you can make them all by yourself. Press the control button. Here is a picture of a circle. Remember where you start to make a circle and which way you go. Now make it on your paper. As soon as you have finished, push the control button again and make the next shape. Keep on pushing the control and making each shape until there are no more. Remember where to start and which way to go. Hold your paper straight and make your lines without lifting your pencil from the paper. Now, go ahead.

NAME________________________________

Summary of Components of Kindergarten Visual-Motor Program

I. DUBNOFF PROGRAM/Level 1	Highest Level Attained	Date
A. Straight Line Concept		
B. Circular Concept		
C. Diagonal Line Concept		
D. Intersecting Lines Concept		

II. Gesell Visual-Motor Subtest



III. Cube Blocks (DLM)	Highest Level Card	Date	Not Used
A. Horizontal			
B. Vertical			
C. Perspective			
IV. Large Parquetry Designs (DLM)			
V. Small Parquetry Designs (DLM)			
A. Designs I			
B. Designs II			
C. Designs III			

	Demonstrated Competency		
	YES (date)	NO	NOT USED
VI. Bead Sequencing Cards			
Large Cards			
1-A			
2-A			
3-A			
4-A			
1-C			
2-C			
3-C			
4-C			
Small Cards			
1-B			
2-B			
3-B			
4-B			
5-B			
VII. Geometric Inserts			
A. Red and Black			
B. Yellow and Blue			
C. Red and Yellow			
D. Plain			
VIII. Clear Plastic Geometric Forms, Tracing			
A. Straight Line			
B. Circle			
C. Square			
D. Triangle			
E. Vertical Diamond			
F. Horizontal Diamond			
IX. Bolt Board			

APPENDIX E

TEST DATA

TABLE 1

TEST DATA FOR LOW DEVELOPMENTAL LEVEL - EXPERIMENTAL GROUP

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided Rectangle	Horizontal Diamond	Vertical Diamond		
1101	4.5	5.0	2	2	2	1	2	0	1	68	6
1102	4.5	5.5	2	2	1	1	2	1	2	79	5
1103	4.5	5.75	2	2	1	2	2	1	2	95	9
1104	4.5	4.5	2	2	2	1	1	1	1	56	3
1105	4.875	5.25	1	2	2	1	2	1	1	67	6
1106	4.875	5.5	1	2	2	2	3	2	2	71	8
1107	4.75	5.25	1	2	1	2	3	1	2	89	9
1208	4.75	5.375	1	2	2	1	3	1	1	71	2
1209	4.75	4.5	1	2	1	1	1	1	1	47	4
1210	4.75	5.25	1	2	1	2	3	2	2	89	7
1211	4.5	5.0	2	1	2	1	3	1	2	48	7
1212	4.5	4.5	1	2	0	1	1	1	1	59	2
1213	4.5	5.0	2	2	2	1	2	1	1	77	7
1214	4.75	5.25	1	2	2	2	3	2	2	76	7
1215	4.5	4.75	2	2	2	2	3	1	1	75	9
1216	4.75	5.375	2	2	2	1	3	2	1	75	9
1217	4.5	5.25	1	2	2	1	2	2	1	71	6

TABLE 1--Continued

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided **Rectangle**	Horizontal Diamond	Vertical Diamond		
1218	4.75	5.5	1	2	1	2	3	2	1	74	4
1219	4.75	5.875	2	2	2	2	3	2	1	80	7
TEST DATA FOR LOW DEVELOPMENTAL LEVEL - CONTROL GROUP											
2101	4.75	5.25	2	2	1	1	1	1	1	56	4
2102	4.5	5.375	2	2	2	2	2	2	2	84	7
2103	4.875	5.375	2	1	2	2	1	1	1	68	5
2104	4.875	5.0	2	2	2	1	1	1	1	68	5
2105	4.5	5.325	1	2	2	1	1	1	2	72	5
2106	4.5	5.25	1	2	1	1	1	2	1	72	7
2107	4.5	5.5	2	2	2	3	2	1	1	68	6
2108	4.875	5.25	2	2	2	1	1	1	2	87	4
2109	4.875	5.75	1	1	2	2	1	2	1	89	7
2210	4.75	5.375	1	2	2	2	1	1	1	73	6
2211	4.75	5.375	2	2	1	1	1	1	2	71	8
2212	4.75	5.75	2	2	2	3	3	2	2	88	6
2213	4.75	5.0	1	2	0	2	3	2	2	72	6

TABLE 1--Continued

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided Rectangle	Horizontal Diamond	Vertical Diamond		
2214	4.75	5.375	1	2	2	3	3	1	1	85	6
2215	5.0	5.5	1	2	1	2	3	2	2	79	7
2216	4.5	5.5	2	1	1	3	3	1	1	73	7
2217	4.5	5.25	1	2	2	2	2	1	1	67	4
2218	4.75	5.0	2	2	2	2	1	1	1	76	5
2219	4.75	5.5	1	1	2	2	3	1	1	80	7
2220	4.5	4.5	2	2	2	2	3	1	1	69	4
TEST DATA FOR HETEROGENEOUS DEVELOPMENTAL LEVEL - EXPERIMENTAL GROUP											
3101	5.0	5.75	2	2	2	1	3	1	2	77	7
3102	4.75	5.5	2	2	2	2	3	2	2	83	9
3103	5.0	5.375	2	2	2	1	2	2	2	86	8
3104	4.875	5.375	1	2	2	1	2	2	2	79	8
3105	5.25	6.25	2	2	2	2	3	2	2	94	8
3106	5.0	5.75	1	2	2	1	3	2	2	87	6
3107	4.875	5.5	2	2	2	3	3	1	1	94	8
3108	5.0	5.5	2	2	2	2	2	2	2	72	5

TABLE 1--Continued

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided Rectangle	Horizontal Diamond	Vertical Diamond		
3109	5.25	5.75	1	2	2	2	1	2	2	97	8
3110	5.625	6.25	2	2	2	3	3	2	2	94	7
3111	4.75	5.375	2	2	2	1	2	2	2	73	6
3112	5.0	5.75	2	2	2	1	2	2	2	77	7
3213	4.5	5.25	1	2	1	1	3	1	2	74	6
3214	4.5	5.25	2	2	2	1	2	2	1	63	5
3215	5.0	6.0	2	2	2	2	3	1	1	85	7
3216	5.0	5.375	2	2	1	1	3	2	2	95	8
3217	5.0	5.75	2	2	1	1	3	2	2	93	9
3218	5.25	5.875	1	2	2	2	3	2	2	87	5
3219	5.0	5.875	2	2	2	2	3	2	2	95	6
3220	4.875	5.5	1	2	2	1	2	1	1	82	7
3221	5.25	5.75	2	2	2	2	3	1	1	97	7
3222	5.25	5.75	2	2	2	2	3	1	1	87	8
3223	5.0	5.75	1	2	2	1	3	1	2	95	7
3224	4.75	5.25	1	2	2	2	3	2	2	76	7
3225	5.0	5.5	1	2	2	2	2	2	2	95	9

TABLE 1--Continued

TEST DATA FOR HETEROGENEOUS DEVELOPMENTAL LEVEL - CONTROL GROUP

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided **Rectangle**	Horizontal Diamond	Vertical Diamond		
4101	4.5	5.5	1	1	2	1	1	1	1	82	7
4102	5.0	4.875	1	2	2	1	3	2	2	87	9
4103	5.75	6.0	2	2	2	2	3	2	2	101	9
4104	5.0	5.25	1	2	2	2	2	0	1	62	5
4105	5.25	5.75	1	2	2	1	3	2	2	94	7
4106	5.125	5.375	2	2	1	3	1	1	1	81	8
4107	5.0	5.75	1	2	2	3	3	1	1	88	5
4108	5.25	5.75	2	2	2	1	3	1	1	94	6
4109	4.875	5.5	1	2	1	3	1	1	1	76	8
4110	5.0	6.0	1	2	1	2	1	2	1	94	9
4111	5.0	6.0	2	2	1	3	1	2	2	96	8
4112	5.0	5.75	1	2	1	3	1	1	1	94	6
4213	5.25	5.375	1	2	2	2	3	2	2	89	6
4214	4.5	5.75	2	2	1	1	1	1	1	76	5
4215	5.25	5.5	1	2	0	2	1	2	2	77	7
4216	5.25	6.25	2	2	2	2	2	2	2	84	7
4217	5.125	5.5	2	2	2	2	1	2	2	84	8

TABLE 1--Continued

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided **Rectangle**	Horizontal Diamond	Vertical Diamond		
4218	4.875	5.375	2	2	2	1	1	1	2	98	9
4219	5.0	5.375	1	2	2	1	2	1	2	77	8
4220	4.875	5.5	2	2	2	2	3	1	1	84	8
4221	5.25	6.0	1	2	2	1	1	2	2	88	8
TEST DATA FOR HIGH DEVELOPMENTAL LEVEL - EXPERIMENTAL GROUP											
5101	5.25	6.0	1	2	2	3	3	1	1	90	9
5102	5.25	5.875	2	2	1	3	3	2	2	101	9
5103	5.25	5.75	2	2	2	3	1	2	2	87	8
5104	5.625	5.5	2	2	2	3	3	1	2	86	9
5105	5.25	5.75	2	2	1	3	3	1	1	93	6
5106	5.25	6.25	2	2	2	2	3	1	2	89	9
5107	5.25	5.875	2	2	2	3	2	2	2	95	6
5108	5.25	5.75	2	2	1	2	2	1	2	83	6
5109	5.625	6.0	2	2	2	2	3	2	2	99	9
5110	5.625	6.125	2	2	2	3	3	1	2	99	7
5111	5.25	5.75	1	2	2	1	3	1	2	83	6

TABLE 1--Continued

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided Rectangle	Horizontal Diamond	Vertical Diamond		
5112	5.25	6.0	2	2	2	3	2	2	2	91	7
5113	5.25	5.75	2	2	2	2	3	2	2	91	8
5114	5.25	6.0	1	2	2	2	3	1	1	87	6
5115	5.625	5.5	2	2	2	2	3	1	1	86	8
5116	5.25	5.5	2	2	2	1	3	1	2	88	8
5117	5.25	5.875	2	2	2	1	3	2	2	100	8
5218	5.625	6.0	2	2	2	1	3	2	2	101	9
5219	5.25	6.125	2	2	2	2	2	1	2	97	9
5220	5.25	5.875	1	2	2	3	3	2	2	100	8
5221	5.25	5.75	1	2	2	2	3	2	2	83	9
5222	5.25	5.875	2	2	2	2	3	2	2	89	9
5223	5.25	5.875	1	2	2	3	3	2	3	93	8

TEST DATA FOR HIGH DEVELOPMENTAL LEVEL - CONTROL GROUP

6101	5.25	5.75	2	2	1	1	1	1	1	89	8
6102	5.625	6.0	2	2	2	3	1	2	3	95	9
6103	5.25	5.75	2	2	2	2	1	1	1	93	9

TABLE 1--Continued

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided **Rectangle**	Horizontal Diamond	Vertical Diamond		
6104	5.25	5.875	2	2	2	1	1	1	1	88	7
6105	5.25	5.875	1	2	2	1	1	2	2	82	8
6106	6.25	5.625	2	2	2	3	3	2	3	92	9
6107	5.25	5.625	2	2	2	2	1	1	1	77	6
6108	5.375	5.875	1	2	2	2	1	2	2	92	8
6109	5.375	5.375	2	2	2	3	2	1	3	91	6
6110	5.0	5.875	1	2	2	1	1	1	1	95	8
6111	5.125	6.0	2	2	2	2	2	1	2	82	9
6112	5.25	6.0	1	2	2	2	1	2	1	99	8
6113	5.25	5.75	2	2	2	2	3	2	2	85	8
6114	5.25	5.75	2	2	2	3	1	2	2	91	9
6215	5.5	5.75	2	2	2	3	3	2	1	92	6
6216	5.25	5.5	1	2	2	1	1	2	1	83	9
6217	5.25	6.26	2	2	2	3	3	2	2	99	9
6218	5.5	5.875	1	2	1	1	3	2	2	95	9
6219	5.625	5.75	1	2	1	3	3	2	2	94	9
6220	5.625	6.0	2	2	2	1	3	1	2	84	8
6221	5.25	5.5	2	2	2	2	3	2	2	89	6

TABLE 1--Continued

Code	GDPE Pre	GDPE Post	GDPE Copy Forms							Gates-MacGinitie Total Weighted Score	Gates-MacGinitie Subtest VI
			Circle	Cross	Square	Triangle	Divided Rectangle	Horizontal Diamond	Vertical Diamond		
6222	5.625	6.0	1	2	1	2	2	1	2	88	9
6223	5.25	5.5	2	2	2	2	1	1	1	71	8
6224	5.25	5.75	2	2	1	3	3	1	1	78	8

TABLE 2

GDPE Age Equivalents and Converted Scores

GDPE Age Equivalents	Converted Score
4B	4.0
4B - A	4.125
4A	4.25
4A - 4½B	4.375
4½B	4.5
4½B - A	4.625
4½A	4.75
4½A - 5B	4.875
5B	5.0
5B - A	5.125
5A	5.25
5A - 5½B	5.375
5½B	5.5
5½B - A	5.625
5½A	5.75
5½A - 6B	5.875
6B	6.0
6B - A	6.125
6A	6.25